FINAL REPORT

STUDY AREA SCREENING EVALUATION WORK PLAN

NAVAL EDUCATION AND TRAINING CENTER, NEWPORT, RHODE ISLAND

Contract No. N62472-86-C-1282
December, 1992

Prepared For:
Northern Division
Naval Facilities Engineering Command
Lester, Pennsylvania

Submitted By:
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NAVAL EDUCATION AND TRAINING CENTER,
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

TABLE OF CONTENTS

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

-INTRODUCTION AND PROJECT BACKGROUND-

STUDY AREA SCREENING EVALUATION WORK PLAN NAVAL EDUCATION AND TRAINING CENTER, NAVAL UNDERSEA WARFARE CENTER NEWPORT, RHODE ISLAND

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TABLE OF CONTENTS

Page

INTRODUCTION AND PROJECT BACKGROUND

TABLE OF CONTENTS CONT'D.

INTRODUCTION AND PROJECT BACKGROUND

TABLES

FIGURES

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

This report presents the Work Plan for the environmental investigation of three sites on the U.S. Navy Naval Education and Training Center (NETC) and Naval Undersea Warfare Center (NUWC) in Newport, Rhode Island. The location of the NETC and NUWC, which are collectively hereafter referred to as the Newport Naval Base, is shown on Figure 1. Under this investigation, the three sites have been referred to as "Study Areas". The sites were also assigned numbers under the Initial Assessment Study previously conducted at NETC (Envirodyne Engineers, Inc., 1983). The following are the three sites being addressed under this investigation:

- Study Area #04 - Coddington Cove Rubble Fill Area
- Study Area #08 - NUSC Disposal Area
- Study Area #17 - Gould Island Electroplating Shop

The Initial Assessment Study (IAS) conducted by the Navy in 1983 identified sites where contamination is suspected to exist and which may pose a threat to human health or the environment. A total of eighteen potential sites were identified by the IAS. Six of these sites which were judged to require further study were investigated under a Confirmation Study (CS) completed in 1986. One of the CS sites, the Gould Island Electroplating Shop, is being studied further under this investigation. In addition, the other two sites included in this investigation were initially studied in the IAS and are now being reexamined. The three sites included in this investigation are being reexamined by the Navy to assess the presence and nature of environmental contamination at each site.

The entire NETC was listed on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites in November 1989. The NPL identifies those sites which pose a significant threat to the public health and environment. Five other sites at NETC, McAllister Point Landfill, Melville North Landfill, Old Fire Fighting Training Area, Tank Farm Four, and Tank Farm Five, are currently being studied under Remedial Investigations (RI) conducted by the Navy under the Department of Defense

Installation Restoration (IR) Program (TRC, 1991). This program is similar to the U.S. EPA's Superfund Program authorized under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

A Federal Facilities Interagency Agreement (FFA) was signed by the Navy, the State of Rhode Island, and the EPA on March 23, 1992. The FFA outlines response action requirements under the Department of Defense Installation Restoration Program at the NETC. The FFA was developed, in part, to ensure that environmental impacts associated with past and present activities at NETC are thoroughly investigated and remediated, as necessary. The five sites currently being investigated under the Remedial Investigations and the three sites being addressed under this investigation are listed in the FFA. All but one of the five RI sites, the Melville North Landfill, are listed in the FFA as Areas of Contamination (AOC). The Melville North site was excessed (or sold) by the Navy prior to being listed on the NPL and is therefore being addressed as a Formerly-Used Defense Site (FUDS). The investigation currently planned to address the three study areas is referred to as a Study Area Screening Evaluation (SASE) in the FFA.

1.2 OVERALL PROJECT OBJECTIVES AND GOALS

The objective of this Work Plan is to define the level of investigation planned to assess the presence and nature of environmental contamination at the three study areas. The site investigations will be conducted at each site to assess the presence of any hazardous substances, the nature of any materials disposed, and the potential for releases of contamination. The findings of these SASE investigations will be used to assess the need to perform any further environmental investigations at each site.

2.0 NETC/NUWC BACKGROUND INFORMATION

2.1 LOCATION

The Naval Education and Training Center (NETC) and Naval Undersea Warfare Center (NUWC) (formerly the Naval Underwater Systems Center or NUSC) are located within the Newport Naval Base, which encompasses approximately six miles of the western shore of Aquidneck Island, Newport County, Rhode Island. Aquidneck Island is comprised of three towns; Newport, Middletown, and Portsmouth. A map of the relative locations of NETC and NUWC areas is provided as Figure 1. NETC serves as a training facility and provides logistic support for the Newport Naval Base. NETC occupies approximately 1,063 acres of land. NUWC is the principal Navy research, development, test and escalation center for submarine warfare and weapons systems. NUWC occupies approximately 191 acres within NETC. The locations of the three SASE sites within the Newport Naval Base are shown on Figure 2.

2.2 HISTORY

Extensive information on the history of the Newport Naval Base was presented in the Initial Assessment Study (Envirodyne Engineers, 1983). Text from this report has been excerpted and referenced with appropriate page numbers below.

> "The Newport area was first used by the Navy during the Civil War when the Naval Academy was moved from Annapolis, Maryland to Newport in order to protect it from Confederate troops. The Naval Academy operated at Newport for about four years before returning to Annapolis.
>
> In 1869, the experimental Torpedo Station at Goat Island was established. This was the Navy's first permanent activity at Newport. The station was responsible for developing torpedoes and conducting experimental work on other forms of Naval ordnance.
>
> In 1881, Coasters Harbor Island was acquired by the Navy from the City of Newport and used for training purposes. In 1884, the Naval War College was established on the island. A causeway and bridge linking the island to the mainland was constructed in 1892. In 1894, the USS Constellation was permanently anchored as a training ship for the Naval War College.

The Melville area was established as a coaling station for the steam-powered ships in 1900. The Navy purchased 160 acres of land and constructed the Narragansett Bay Coal Depot. With the advent of ships burning liquid fuel, it became necessary to add oil tanks. Consequently, in 1910, four fuel oil tanks were added in the Melville area. These tanks are still used today.

In 1913, the Navy established the Naval Hospital on the mainland of Aquidneck Island. At this time the main hospital building was constructed.

The outbreak of Word War I caused a significant increase in military activity at Newport. Some 1,700 men were sent to Newport and housed in tents on Coddington Point and Coasters Harbor Island. A bridge was built at this time connecting Coddington Point with Coasters Harbor Island. In 1918, Coddington Point was purchased by the Navy. Much of the base organization was then transferred to Coddington Point. During the war, numerous destroyers and cruisers were fueled by the Melville Coal Depot and fuel tanks. By this time, a pipeline had been extended to the north fueling pier and two additional oil tanks constructed.

Following World War I, fuel oil gradually replaced the use of coal by the Navy fleet. In 1921, the Coal Depot was changed to the Navy Fuel Depot. In 1931, the coal barges and coaling equipment were sold to the highest bidder.

In 1923, some two hundred buildings, which were part of the emergency war camps established on Coddington Point, were stripped and sold for scrap. The base remained relatively inactive until the onset of World War II.

Reactivation of the base occurred in the late 1930's as a result of military build-up in Europe. Just prior to the reactivation, a 1938 hurricane and tidal wave had destroyed or severely damaged over 100 buildings and much of the sea walls. In 1940, Coddington Cove was acquired for use as a supply station, and hundreds of Quonset huts were constructed throughout the base. Additional barracks were constructed on Coasters Harbor Island, increasing the base housing capacity to over 3,500 men. Power plant facilities were also constructed at this time. Coddington Point was reactivated to house thousands of recruits. The Anchorage housing complex in the Coddington Cove area was constructed in 1942. In the Melville area, additional fuel facilities were constructed along with a Motor Torpedo Squadron Boat Training Center and nets for harbor defense. Tank Farms 1 through 5 were constructed during this time period. The Fire Fighting School, Fire Control Training Building, and the Steam Engineering Building were constructed in 1944.

The Torpedo Station at Goat Island was very active during World War II and had expanded its operation to Gould Island. The Torpedo Station employed more than 13,000 people and manufactured 80 percent f all torpedoes used by our country during the war. The station was the largest single industry ever operated in Rhode Island.

Following World War II, naval activities at Newport converted to a peace time status. This resulted in a reduction of naval activity. Some 300 Quonset huts and buildings were removed, and the entire naval complex was consolidated into a single naval command designated the U.S. Naval Base in 1946.

The Naval Base adjusted to its peace time status by increasing its activities in the fields of research and development, specialized training, and preparedness for modern warfare. There was a brief period during the Korean War when some 25,000 sailors trained at Newport.

In 1951, the Torpedo Station was permanently disestablished after 83 years of service. Future manufacture of torpedoes was to be awarded to private industry. In place of the Torpedo Station, a new research and development facility, the Naval Underwater Ordnance Station, was established and given the responsibility of overseeing the private contractors. The Officer Candidate School was also established in 1951.

In 1952, the Training Station and other naval schools were disestablished, and the U.S. Naval Station and the U.S. Naval Schools Command were established.

In 1955, Pier 1 was constructed, with Pier 2 being added in 1957. Newport became the headquarters of the Commander Cruiser-Destroyer Force Atlantic in 1962. Some 55 naval warships and auxiliary craft were homeported at Newport. New housing and bachelor quarters were added in the late 1950's and early 1960's.

Major expansion of the Naval War College occurred during the late 1950's and early 1970's, transforming the college into a major university. In July of 1971, The Naval Schools Command was restructured and named the Naval Officer Training Center (NOTC).

In April of 1973, the Shore Establishment Realignment Program (SER) was announced and resulted in the largest reorganization of Naval forces in the Newport Area. The fleet stationed in Newport was relocated to other naval stations on the east coast. SER resulted in the disestablishment of the Naval Communication Station and the Fleet Training Center and related activities. The Public Works Center, Naval Supply Center, Naval Station and Naval Base were absorbed by NOTC. In April of 1974, NOTC was changed to the Naval Education and Training Center (NETC).

The drastic changes which resulted from SER caused a reduction of Navy personnel, both military and civilian, in excess of 14,000. Coupled with the reductions at the Naval Construction Battalion Center at Davisville, and the closure of the Naval Air Station at Quonset Point, SER had severe economic impacts in the Narragansett Bay area.

The reorganization brought about by SER resulted in the Navy excessing some 1,629 [1,374] acres of its 2,420 [2,805] acres. Some of the land has been leased to the State of Rhode Island pending final sale of the land by the General Services Administration.... The Navy also leases 44 acres of land in Coddington Cove to the State of Rhode Island and Economic Development Corporation. The state has subleased this property to a private enterprise engaging in shipbuilding and repair. Also, a fish food processing operation utilizes the cold storage warehouse in Building 42 near Pier 1. [The fish food processing operation reportedly ceased operations in 1983].

The above information on the history of the installation was obtained from the most recent Master Plan (NORTHDIV, 1980), the 1981 Annual Report of the Navy in the Rhode Island Area (NETC Public Affairs Office, 1981), and the Command Histories at the Naval History Office in Washington, D.C."

(pp. 5-6 to 5-14)

2.3 PREVIOUS SITE INVESTIGATIONS

The NETC and NUWC facilities have been under assessment through the Department of the Navy's Assessment and Control of Installation Pollutants (NACIP) program. The NACIP program was established to identify and control environmental contamination from past use and disposal of hazardous substances at Naval installations. The NACIP program is part of the Department of Defense Installation Restoration Program, which is similar to the U.S. EPA's Superfund program authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The NACIP program consists of three phases: Phase I - Initial Assessment Study (IAS), Phase II - Confirmation Study (CS), and Phase III - Corrective Action Measures.

The IAS (Envirodyne Engineers, 1983) identified areas where potential contamination from past waste storage, handling, or disposal practices may pose threats to human health or the environment. Eighteen potentially contaminated areas were identified in the IAS report. Two of the areas were subsequently found to be outside of the scope of the NACIP program and were not discussed further in the report. The IAS concluded that no further action was required at three of the areas. Further investigation was recommended at the remaining thirteen areas.

A Confirmation Study was conducted at six of the thirteen areas recommended for further investigation. Table 1 provides a summary of the IAS recommendations for further study, at the sixteen sites reviewed. Table 1 also notes whether a Confirmation Study has been conducted at the three subject study areas (bolded) and the remaining ten areas.

Confirmation studies were conducted for one of the three subject study areas. The Confirmation Studies (Loureiro Engineering, 1986) conducted at the Gould Island Electroplating Shop consisted of two steps: a Verification Step and a Characterization Step. The objectives of the Verification Step were to locate sources of contamination, determine the presence of specific toxic and hazardous materials, and determine general site hydrogeology. The objective of the Characterization Step was to develop a quantitative assessment of the contamination identified in the Verification Step.

Under the IR Program, a Remedial Investigation (RI) is currently being conducted at five other IAS sites on the NETC. The findings of the Phase I RI are presented in a draft RI report (TRC, 1991). Phase II RIs are currently being planned for the five RI sites. The locations of the five RI sites and the three subject SASE sites are shown on Figure 3.

2.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.4.1 Regional Geology

This section summarizes regional geologic information obtained from the IAS and Phase I RI reports. The section below was obtained directly from the IAS report, and is referenced as such.

> NETC is located at the southeastern end of the Narragansett Basin. This basin is a complex synclinal mass of Pennsylvanian aged sedimentary rocks and is the most prominent geologic feature in eastern Rhode Island and adjacent Massachusetts. Narragansett Basin is an ancient north to south trending structural basin originating near Hanover, Massachusetts. The basin has a length of approximately 55 miles and varies from 15 to 25 miles wide. The western margin of the basin is in the western portion of Providence, Rhode Island, and

the eastern margin runs through Fall River, Massachusetts. Exposures of older rocks on Conanicut Island and in the vicinity of Newport suggest that the southern extent of the basin is near the mouth of Narragansett Bay.

The rocks of the Narragansett Basin are non-marine sedimentary rocks of Pennsylvanian age. The rocks are chiefly conglomerates, sandstones, shales, and anthracite. Total thickness of the strata in the Narragansett Basin has been estimated at 12,000 feet. Both vertical and lateral irregularities in the lithologic character of the rock are present within the basin. Many folds and some faults occur throughout the basin, but the character and amount of the folding and faulting are not clearly known. The sedimentary rocks of the basin are believed to have been deposited in a lowland area which was surrounded by an upland area of considerable relief. The presence of coal beds within the basin also indicates that there were fairly extensive swampy areas. Figure 5.3-2 [Figure 4] shows a general geologic map of Rhode Island.

The bedrock of the Narragansett Basin has been divided into the following five units: the Rhode Island Formation, Dighton Conglomerate, Wansulta Formation, Pondville Conglomerate, and Felsite at Diamond Hill. At NETC and most of the surrounding area, the bedrock is entirely of the Rhode Island Formation, and thus, only this unit will be examined in detail. Figure 5.3-3 [Figure 5] represents a detailed look at the bedrock geology at NETC and the surrounding areas.

The Rhode Island Formation is the most extensive and thickest of the Pennsylvania formations in Rhode Island. The vast majority of the Narragansett Basin is underlain by this formation. Included within the Rhode Island Formation are fine to coarse conglomerate, sandstone, lithic graywacke, graywacke, arkose, shale and a small amount of meta-anthracite and anthracite. Most of the rock is gray, dark gray, and greenish, but the shale and anthracite are often black. Crossbedding and irregular, discontinuous bedding is characteristic of the formation. Rocks of the Rhode Island Formation, which are in the northern portions of the basin, are strong and indurated but are not metamorphosed. However, those rocks in the southern portion of the basin, such as the NETC, are metamorphosed, and these rocks contain quartz-mica schist, feldspathic quartzite, garnet-stacrolite schist, and some quartz-mica-sillimanite schist. The beds of meta-anthracite and anthracite are mostly thin, but many areas within basin have been mined. Vein quartz, fibrous quartz, and pyrite are commonly associated with these coal layers, and the ash content is high.

Within the Rhode Island Formation, there are a few areas of thick conglomerates. These conglomerate layers are gray to greenish in color and are mostly very coarse. These conglomerates consist of pebbles, cobbles, and boulders (up to several feet long), interbedded with sandstone and graywacke. The stones are predominantly quartzite and have been elongated as a result of tectonic forces in the southern portion of the basin. These thick conglomerate layers are more resistant to erosion than are the surrounding rocks and thus, are topographically higher. Coasters Harbor Island is mostly covered with this conglomerate material.

Throughout the Narragansett Basin, the Pennsylvanian rocks are underlain by pre-Pennsylvanian igneous and metamorphic rocks such as Bulgarmarch granite, Metacom granite gneiss, porphyritic granite and slate and quartzite. For the most part, these basement rocks are deeply buried beneath the Pennsylvanian rocks. However, these older rocks occur north of NETC in the Bristol area and south of NETC in the Fort Adams and Newport Neck areas and on the southern tip of Conanicut Island. Rose Island and Goat Island also have older metamorphic rocks of slate and quartzite.

Overlying the Pennsylvanian rocks of the Narragansett Basin are surficial deposits of Pleistocene sediments. These Pleistocene sediments owe their origin to the Wisconsin glaciation which covered the area with ice several thousand feet thick. As the glaciers receded some 10,000 to 12,000 years ago, they deposited unconsolidated glacial materials of variable thicknesses throughout the Narragansett Basin area. The unconsolidated glacial material ranges from 1 to 150 feet thick, being thicker in the valleys and thinner in the uplands. The glacial material consists of till, sand, gravel, and silt. These glacial deposits were derived from shale, sandstone, conglomerate, and in a few places, coal. The glacial materials serve as the parent materials for the soils in the area. Areas where sand and gravel were deposited serve as important regional mineral sources. . . .

(IAS, pp. 5-18, 5-21)

Much of the geologic information contained in this section was obtained from Geological Survey Bulletin 1295. . . .

(IAS, pg. 5-21)

Several soil borings were completed into bedrock as part of a Remedial Investigation conducted at five other sites within the NETC (TRC, 1991). Bedrock was encountered at four of the RI sites. Generally, the bedrock consisted of a grey-green to black, highly weathered to competent, carboniferous shale. Rock cores indicated a high degree of fracturing with quartz and iron oxide deposits present along the fracture planes. Depth to bedrock varied amongst boring locations from approximately one to 33 feet below ground surface.

Glacial till deposits were encountered overlying the bedrock at NETC during the RI investigations. The till material was characterized as containing fine to coarse sand with varying amounts of silt, with some horizons containing weathered shale fragments. A single Shelby Tube sample of the till indicated a triaxial permeability of 2.7×10^{-7} cm/sec (7.7×10^{-4} feet/day). Natural deposits of sand and silt and organic muck were also encountered.

2.4.2 Regional Hydrogeology

This section presents information on the regional hydrogeology. The regional hydrogeology information was primarily obtained directly from the IAS report and is referenced as such.

> Throughout the area, depth to ground water ranges from less than one foot to about 30 feet, depending upon the topographic location, time of year, and character of subsurface deposits. The average depth to the ground water is around 14 feet on Aquidneck Island and moves from areas of high elevations to Narragansett Bay or the Sakonnet River.
>
> Seasonal water level fluctuations are common in the area. These fluctuations range from less than 5 feet to as much as 20 feet on the hills. In the valleys and lowland areas, the fluctuations are generally less than 5 feet. During the late spring and summer, the water table usually declines as a result of evaporation and the uptake of water by plants, and rises during autumn and following winter thaws.
>
> The unconsolidated glacial deposits range in thickness from less than one foot near the rock exposures to about 50 feet throughout Aquidneck Island. Most of the glacial deposits are till, but isolated outwash areas occur. In the NETC area, the glacial deposits are till with a thickness of less than 20 feet. Wells completed in the till are usually dug and range in depth from less than 10 feet to as much as 75 feet. The average depth for these wells is about 20 feet. These dug wells are usually 2 to 3 feet in diameter and are usually dug down to the top of the bedrock.
>
> The yield of till wells varies considerably depending upon the type and thickness of the water-bearing deposits penetrated. Yields range from less than one to as much as 120 gallons per minute. Under normal weather conditions, till wells yield a few hundred gallons of water per day and are adequate for domestic supplies. The large diameter of dug wells also provides substantial water storage area between periods of use. Each foot of water in a 3-foot diameter well represents storage of 53 gallons. However, these wells are subject to going dry during seasonal or unusual droughts.

> Bedrock wells in the area range from 14 to 1,300 feet in depth. The average depth for these bedrock wells is 135 feet. Yields from bedrock wells range from less than one to as much as 55 gallons per minute. Most wells yield less than 10 gallons per minute. The yields vary considerably in the bedrock over short distances because the joints and fractures which transmit water to the wells occur intermittently. Joints and fractures are most numerous and widest near the top of the bedrock and become fewer and narrower with depth. Bedrock wells seldom go dry, but yields can be extremely low if not enough fractures and joints occur in the area of the well.
>
> The chemical characteristics of the ground water are similar throughout the area, and the water is generally satisfactory for most ordinary uses. Most ground water in the area is soft or only moderately hard, with ground water from till generally containing less mineral matter and being softer than ground water from bedrock. Areas where the ground water has high iron content are scattered throughout the area, being most numerous around Newport and Middletown and the northern part of Portsmouth. Wells which have a high iron content usually penetrate only rocks of Pennsylvanian age.
>
> In scattered locations near the shoreline, over-pumping has led to salt water intrusion in some wells. Bedrock wells are not as easily contaminated with salt water as are till wells, but the chance of contamination increases as the depth of the well below sea level increases.
>
> No wells were identified within the boundaries of NETC other than on Gould Island, although there are numerous wells in close proximity. These wells are upgradient of NETC. . . .

(IAS, pp. 5-31 to 5-34)

Information obtained from the Phase I Remedial Investigations indicated that, in general, ground water on NETC flows from east to west towards Narragansett Bay. Depth to ground water ranged from approximately four to 28 feet below ground surface at these RI sites. Slug tests conducted on monitoring wells at these sites indicated that the hydraulic conductivity of the till unit ranged from 0.22 to 0.44 feet per day and upper bedrock hydraulic conductivity ranged from 0.029 to 0.21 feet per day. The RI report noted that bedrock test data produced hydraulic conductivities higher than those normally attributed to shale (3.28 x 10^{-4} to 3.28 x 10^{-8} feet per day (Driscoll, 1987).

2.4.3 Ground Water Classifications

The Rhode Island Department of Environmental Management (RIDEM) has classified ground water in Rhode Island to protect and restore the quality of the state's ground water resources for use as drinking water and other beneficial uses, and to assure protection of the public health and welfare, and the environment. A copy of RIDEM's Rules and Regulations for Groundwater Quality is provided in Appendix A. Figure 6 indicates the relative location of the three subject sites and RIDEM ground water classes. The ground water under the three SASE subject sites has been classified as follows:

Study Area	RIDEM Ground Water Classification
Coddington Cove Rubble Fill Area	Class GB
NUSC Disposal Area	Class GB
Gould Island Electroplating Shop	Unclassified/Class GA

Ground water classified GA is known or presumed to be suitable for drinking water without treatment. Ground water classified GB may not be suitable for drinking water without treatment due to known or presumed degradation. GB classified ground water is primarily located at highly urbanized areas or is located in the vicinity of disposal sites for solid waste, hazardous waste or sewerage sludge. Areas which are unclassified are presumed by RIDEM to be Class GA ground water.

2.4.4 Regional Surface Water Hydrology

The regional surface water hydrology for the Newport Naval Base is presented below. Much of the regional information was obtained from the IAS report, and is referenced as such with page numbers which follow the excerpts.

> NETC is located within the Narragansett Bay Drainage Basin which is shown in Figure 5.3-5 [Figure 7]. This drainage basin covers an area of 1,850 square miles, 1,030 square miles of which are in Massachusetts and 820 square miles of which are in Rhode Island. All surface water drainage from the basin is into Narragansett Bay. Three major rivers, the Taunton, Blackstone, and Pawtucket,

as well as the Providence River and a number of smaller rivers and streams, drain into Narragansett Bay. Discharge from Narragansett Bay is into the Atlantic Ocean between Point Judith and Sakonnet Point in Rhode Island.

Throughout NETC, the surface drainage is westward toward Narragansett Bay with the exception of one area in Tank Farm #2 which drains eastward into Melville Reservoir. Surface drainage at NETC is provided by the Melville Ponds, Normans Brook, Lawton Brook and Reservoir, Gomes Brook, a stream and pond in the northeastern portion of NUSC [now NUWC], and a stream discharging into Coasters Harbor. The surface drainage for NETC is shown in Figure 5.3-6 [Figure 8]. All these streams discharge into Narragansett Bay.

The Melville Ponds receive surface drainage from portions of Tank Farms #1 and #2 and from Navy housing in Melville North. Lawton Brook receives drainage from portions of Tank Farm #3, while portions of Tank Farm #4 drain into Normans Brook. Gomes Brook receives drainage from portions of Tank Farm #5.

While these streams and ponds receive drainage from many of the areas within NETC, a substantial portion of the NETC area drains directly into Narragansett Bay or infiltrates into the soil before reaching a stream or body of water. Direct runoff into Narragansett Bay would especially occur following thunderstorms.

(IAS, pp. 5-26, 5-28)

2.4.5 Regional Surface Water Classifications

The surface water quality classifications for Narragansett Bay, as determined by RIDEM, are shown on Figure 9. Most of the Narragansett Bay is classified as Class SA, which means it is suitable for bathing and contact recreation, shellfish harvesting for direct human consumption, and fish and wildlife habitat.

Areas classified as Class SB are suitable for public drinking water with appropriate treatment, agricultural uses, bathing, other primary contact recreational activities, and fish and wildlife habitat. Areas classified as Class SC are suitable for boating, other secondary contact recreational activities, fish and wildlife habitat, industrial cooling, and good aesthetic value.

Two freshwater streams located on NETC property have been classified as Class B surface waters. Class B surface waters are suitable for public water supply with appropriate treatment, agricultural uses, bathing, other primary contact recreational activities, and fish and wildlife habitat. The following is a description of water quality classifications for Narragansett Bay in the NETC area, as obtained directly from the State surface water quality regulations (RIDEM, Division of Water Resources, Section 6 - Water Quality Standards, Appendix A, Narragansett Bay Drainage Basin):

SECTION	CLASSIFICATION
The waters within 500 feet of the firing pier of the US Navy Torpedo Testing Station, Gould Island	SA
The waters in the area easterly from a line drawn from Coggeshall Point southwesterly to the southeasternmost point of Dyer Island and the area easterly from a line drawn from Carr Point northwesterly to the southeasternmost point of Dyer Island	SC
The waters in the vicinity of Taylor Point which are within a 300 foot radius of the Jamestown marine outfall sewer (7 acres)	SC
The waters in the vicinity of Taylor Point, exclusive of those waters described above, south of a line from the northernmost extremity of Taylor Point to Can Buoy 13, north of a line from a point of land approximately 1000 feet south of the Newport Bridge to the northernmost extremity of Rose Island, and within 1000 feet of the shoreline of Jamestown (49 acres)	SB
Unnamed Brook from Greene Lane, Middletown, Rhode Island to East Passage, Narragansett Bay (1-1/2 mile)	B
Unnamed Brook upstream of Greene Lane to headwaters	B
East of a line from Ida Lewis Rock to the southern extremity of Goat Island, east of the line from the northern extremity of Goat Island to the west shore of Coasters Harbor Island, east of a line from the west shore of Coasters Harbor Island to the western extremity of Coddington Point and south and east of a line from the southwestern extremity of Coddington Point to the northern most point of the Coddington Cove breakwater	SC
The area within 1000 feet off of Monroe Street (in the Fort Adams Naval housing complex) on the west shore of Fort Adams, east of line from Fort Adams Light to Rose Island Light to Buoy (FLR) Bell 14 and a line from Buoy (FLR) Bell 14 through Nun Buoy 16 at Coddington Point and its extension to the end (southeastern most point) of the Coddington Cove breakwater	SB

Waters within a 600 foot radius of Greene Lane, Middletown	SB
The waters in the vicinity of Fort Adams, Newport, which are within a 300 foot radius of the Fort Adams marine outfall sewer (4.1 acres)	SC
The waters in the vicinity of Coasters Harbor which are within 500 feet of the Newport marine outfall sewer (18 miles)	SC

(Rhode Island Water Quality Standards, 1988)

A copy of these regulations are provided in Appendix A.

2.4.6 Area Water Use

Public water in the City of Newport and Town of Middletown is supplied and managed by the Newport Water Department. The Town of Portsmouth purchases water from the Newport Water Department but operates its own distribution system. Approximately two thirds of Portsmouth is serviced by public water with the remaining one third supplied water from private water wells. While no specific records exist as to private well use in the information reviewed, in general, the majority of private wells are reportedly located on the eastern portion of Aquidneck Island (Personal Communication, Town of Portsmouth, 1992).

The Newport Water Department receives its water supply from a series of seven surface water reservoirs located on Aquidneck Island and two surface water reservoirs on the mainland. The seven surface water reservoirs on Aquidneck Island are:

1. Lawton Valley Reservoir,
2. St. Marys Pond,
3. Sisson Pond,
4. Easton North Pond,
5. Easton South Pond,
6. Paradise or Nelsons Pond, and
7. Gardners Pond.

Each of these reservoirs is supplied water via rainfall and runoff and is not augmented by ground water supply wells. The Newport Water Department stated that the safe yield of the reservoir system is approximately 11 to 13 million gallons per day (MGD). Water use in 1991 was 7.07 MGD, and adequate capacity reportedly exists for projected water usage on Aquidneck

Island for the next ten to twenty years, or more (Personal Communication, Newport Water Department, 1992). Figure 6 indicates the location of surface water reservoirs (Lawton Valley, Sisson Pond, St. Marys Pond, and the Easton North Pond) in the vicinity of the Newport Naval Base.

The Prudence Island Utilities Company supplies ground water to approximately 800 people on Prudence Island, Portsmouth, located east and off-shore of the Melville area.

The locations of known public ground water supply wells and surface water reservoirs within the Newport Naval Base vicinity are shown on Figure 6. The locations of ground water supply wells were obtained from the February, 1992 RIDEM Ground Water Section Facilities Inventory map for the Prudence Island quadrangle (USGS). The map shows the locations of known public ground water supply wells, in addition to known or suspected sources of ground water contamination. RIDEM Ground Water Section personnel indicated that the location of the supply wells within the Prudence Island Quadrangle had been field verified by RIDEM personnel.

Private wells are reported to withdraw water from till, bedrock, and stratified-drift aquifers. Of these aquifers, bedrock is considered the most reliable source of ground water, and well yields are commonly sufficient for domestic supplies (Johnston, U.S.G.S., undated).

The location, depth, and yield of private bedrock wells in the Prudence Island and Newport Quadrangles are shown on Figures 5.3.9 and 5.3.10 [Figures 10 and 11] as obtained from the IAS report. The IAS report indicated that bedrock wells in the area range from approximately 14 to 1,300 feet deep. Well yields from 55 gallons per minute (GPM) to less than 1 GPM are reported in the IAS report.

3.0 INVESTIGATION-DERIVED WASTE PLAN

3.1 WASTE MANAGEMENT

Investigation-derived waste (IDW) material includes material generated as a result of site investigation activities. These materials include soil samples, auger cuttings, ground water development and sampling purge water, decontamination fluids, and expendable personnel protective equipment. During the course of the Study Area investigations, care will be taken to minimize the amount of IDW material which is generated and handled.

Generally, IDW materials will be placed in DOT-approved 55-gallon drums. Drums will be filled to no more than 90 percent of capacity to allow for the potential expansion of waste material. Drums will be marked with labels and indelible liquid chalk pens by field investigation personnel. Drum labels will be of a contrasting color (e.g., yellow) relative to the drums (e.g., black). Information recorded on the drums and labels will include:

- generator (US Navy, Naval Education Training Center, Newport, Rhode Island, 02841)
- generator EPA identification number,
- source (e.g., site, well number),
- date(s) of generation,
- matrix (e.g., soil, water, etc.), and
- notes (e.g., odors, non-aqueous phase liquids, etc.)

The handling of specific IDW materials is described below. The handling and disposal of all IDW materials will be the responsibility of the US Navy with assistance provided by TRC-EC. The RIDEM and EPA - Region I will be consulted regarding the final disposition of all IDW material.

3.2 WASTE HANDLING & DISPOSAL

3.2.1 Soils

Solid material derived from the subsurface exploration program (e.g., auger spoils, split spoon samples, etc.) will be continuously observed for evidence of potential contamination (e.g., discoloration, odors, etc.) and monitored for the presence of VOCs using a photo and/or flame ionization detector (PID or FID).

Drill cuttings produced from test borings will be backfilled into their respective borings and a cement-bentonite grout will be placed in the top one foot of the borehole as described in the Field Sampling Methodology Plan provided as Appendix B. Drill cuttings produced from monitoring well borings will be containerized in 55-gallon drums.

Drummed well boring cuttings will be segregated on pallets and staged on-site at the completion of the drilling activities. The Navy will be responsible for staging all drums. Analytical results of soil samples collected from well borings will be used to aid in characterizing the associated drummed cuttings.

If full scan (i.e., TCL organics and TAL inorganics) analytical results of soil samples from the test boring and field observations (odors, discoloration, elevated PID or FID readings, etc.) indicate the absence of contamination, the associated drummed soil will be returned to the ground surface near their respective source well location. So as not to interfere with future well sampling events, IDW material will not be placed closer than ten feet, nor further than twenty feet from its source location. The location(s) where any drill cuttings are placed will be recorded in a field notebook.

If field observations (e.g. stains, odors, or elevated PID or FID readings) or the analytical results of soil samples from the boring indicate that the associated drill cuttings are potentially contaminated, the drum contents will be sampled and appropriately characterized.

If characterization testing (e.g., TCLP) of the drums contents indicates the drill cuttings are hazardous, the drummed IDW materials will be transported by a licensed waste hauler for treatment or disposal in accordance with applicable state and federal regulations established under the Resource Conservation and Recovery Act (RCRA). Drill cuttings that do not exhibit any hazardous characteristics but appear contaminated based upon associated TCL/TAL results will be handled on a case-by-case basis. The EPA - Region I and RIDEM will be consulted prior to redepositing any IDW materials on the sites.

3.2.2 Well Water

All well water (e.g., purge and development water) produced from site monitoring wells will be containerized in 55-gallon drums. These drums will be stored with all other site IDW drums at a designated drum staging area on each site. The presence/absence of a non-aqueous phase liquid will be assessed in suspected wells with an oil/water interface probe prior to well development and/or sampling. Any non-aqueous-phase liquids or evidence of possible petroleum contamination (i.e., sheen, odor, elevated OVA response) which are detected or observed in the well will be recorded in a field notebook.

Analytical results of the ground water samples collected from the well will be used to aid in characterizing the drum contents. If full scan TCL/TAL analytical results and field observations (e.g., odors, sheen, elevated OVA response) indicate the absence of contamination, the associated drummed well water will be discharged onto the ground in the vicinity of the respective source well. The well water will not be discharged closer than ten feet, nor further than twenty feet from its source well. The location(s) of the discharged well water will be recorded in a field notebook. The EPA - Region I and RIDEM will be consulted prior to discharging any IDW material on the sites.

If field observations and/or associated sample data indicate that the well water is contaminated, the drummed material will be transported for treatment by a licensed hauler in accordance with local, state, and federal regulations. The treatment of wastewaters at a local publically-owned treatment works will be considered, if appropriate and allowed.

3.2.3 Decontamination Solutions

Downhole drilling equipment (e.g., augers, rods, cutting heads) will be steam cleaned prior to each use. Steam cleaning will be conducted in a designated heavy equipment decontamination area. Rinse waters from steam cleaning will be recovered and contained in a tank truck located at the designated decontamination area for characterization and appropriate off-site treatment.

Sediment/soil generated from steam cleaning operations will be drummed separately at the decontamination area for appropriate characterization and proper disposal.

Chemicals (e.g., hexane, methanol, nitric acid) and water (distilled and tap) used for decontamination of sampling equipment (e.g., split spoons) will be separately collected, containerized, and labelled for proper treatment or disposal. In general, much of the sampling equipment (e.g., stainless steel spoon, bailers) will be laboratory decontaminated, thus reducing the generation of chemical decontamination solutions in the field. However, sampling equipment which is repeatedly used in the field as a part of the sample collection procedure (e.g., split spoon samplers, hand augers) will be decontaminated prior to each use.

3.2.4 Expendable Equipment

Expendable equipment (e.g., tyvek coveralls, gloves, boot covers, etc.) will be placed into trash bags and disposed of in Newport Naval Base outdoor refuse containers. Refuse containers to be used for such disposal will be designated by the NETC Public Works Department. Expendable equipment which is known or believed to be contaminated (e.g., oily gloves) will not be disposed of in refuse containers. Such equipment will be drummed, labelled, and segregated for future disposal.

4.0 PROJECT PLANS

4.1 FIELD SAMPLING PLAN

The Field Sampling Plans (FSPs) for each of the Study Area Screening Evaluations are provided in Volumes I through III of this Work Plan. Site-specific FSPs are provided for each of the three sites being investigated. The purpose of each FSP is to describe the field activities planned under each of the site-specific investigations.

The planned field investigation activities include geophysical surveys, soil gas surveys, and surface soil, test pit, test boring, well boring, ground water, surface water, and sediment sampling. Samples will be collected from each of the sites for laboratory analysis. The survey and sampling methods which will be used at each site are described in the Field Sampling Methodology Plan provided as Appendix B of this Work Plan.

4.2 HEALTH AND SAFETY PLAN

The purpose of the Health and Safety Plan (HASP) is to establish guidelines and requirements for protecting the health and safety of site personnel during field investigation activities. The HASP informs personnel of the currently known and suspected hazards associated with work at each of the sites. Site-specific health and safety considerations on the nature of site wastes, site access/work zone, levels of personnel protection, and types of monitoring are provided in the site-specific Work Plans provided in separate volumes of this Work Plan. Additional information on the project health and safety requirements may be found in the complete HASP provided as Appendix C. Site personnel, including field investigation subcontractors, are required to become familiar with and follow provisions of the HASP.

4.3 QUALITY ASSURANCE/QUALITY CONTROL PLAN

Appropriate EPA and Navy-NEESA Quality Assurance/Quality Control (QA/QC) procedures and requirements will be followed during the study area investigation activities. The complete QA/QC Plan for this project is attached as Appendix D. The QA/QC Plan serves as a controlling mechanism during field sampling to assure valid, reliable, and legally defensible data collection. The QA/QC Plan outlines the organization, objectives, and QA/QC activities which will achieve the desired data quality.

5.0 DATA EVALUATION AND CONCLUSIONS

The Study Area Screening Evaluation (SASE) work plan and investigation effort are being conducted to assess whether the designated Study Areas are a potential threat to human health and the environment. The work plan presented outlines the data needs and activities necessary to confirm or deny a threat, or potential threat, to human health and the environment.

The three Study Areas reviewed include the following:

Study Area 04 Coddington Cover Rubble Fill Area
This site was used from 1978 to 1982 for the disposal of demolition type materials including concrete, scrap lumber, tires, wire, cable, empty paint cans, and ash. The site occupies approximately six acres and is located in the Coddington Cove area of the Newport Naval Base.

Study Area 08 - NUSC Disposal Area
This site was used during the 1970s as a dump for materials including scrap lumber, tires, wire, cable, and empty paint cans. The site is located on the northwestern boundary of the NUWC complex.

Study Area 17 - Gould Island Electroplating Shop
Electroplating and degreasing operations occurred in the northern portion of Gould island (Building 32) during World War II. The wastes generated included muriatic (hydrochloric) acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, nickel sulfate, Anodex cleaner, and degreasing solvents. This site is located on a portion of Gould Island which is currently owned by the Navy.

This section of the SASE work plan discusses activities that will occur after analytical data and non-sampling information from the screening evaluation have been received. These activities include the following:

- Review and validation of analytical data,
- Review of non-sampling information (site history, environmental setting, receptors, etc.),
- Evaluation of risk,
- Conclusions/recommendations or no further action.

The various steps to be followed during the data assessment are described in the following sections.

Review and Validate Analytical Data

The planned data validation effort is described in Section 8.0 of the project Quality Assurance/Quality Control Plan provided in Appendix D. The internal data review considerations will include:

- Sampling protocols,
- Compare data against field and trip blanks to detect potential cross-contamination,
- Review laboratory quality control (e.g., laboratory blanks, method standards, spike recovery, duplicates),
- Summarize detection limits for non-detectable results,
- Review detection limits for positive but non-quantifiable data,
- Review dilution factors for all sample analyses,
- Review background concentrations to help identify site-specific contamination, and
- Highlight unusable data, attach appropriate qualifiers to usable data, and explain limitations of qualified data.

The data will be presented in summary tables ("hits tables") indicating detected concentrations.

Analysis of the data collected will focus on the risks associated with the site by presenting and analyzing data on source characteristics, the nature and extent of contamination, the contaminant fate and transport pathways, and potential effects on human health and the environment.

Evaluate Non-Sampling Information

Following completion of the field investigation program, an evaluation will be performed to assess the quality of the non-sampling information and data obtained during the site investigations. The evaluation will focus on changed site conditions and potential receptors. Observations including site fencing, the proximity of nearby facilities and employees, or other receptors will be noted during the site investigations. Updated non-sampling information will be used to help assess potential site risks.

Evaluation of Risk

A risk evaluation will be performed for each study area. The narrative report will include discussions of the following:

- History and nature of any waste handling at the site;
- Known hazardous substances and nature of any site contamination;
- Potential future uses of the sites;
- Pathways of concern for any hazardous substances or contamination;
- Potential human population and environmental targets;
- Site investigation analytical results (summary tables);
- Analytical data as compared to Applicable or Relevant and Appropriate Requirements (ARARs);
- Risk evaluation with respect to the following:
    - Analytical data,
    - Exposure scenarios,
    - Contaminant toxicity,
    - Uncertainty evaluation, and
    - Summary of risks.

Conclusions/Recommendations

The overall objective of the Study Area Screening Evaluation (SASE) is to provide the basis for a determination that either 1) a RI/FS be performed on the area addressed by the SASE, or 2) the area does not pose a threat, or potential threat, to human health or the environment and therefore the Study Area should be removed from further investigation under the Federal Facility Agreement.

The SASE findings will also be reviewed to determine the need for any additional site investigation activities and/or limited response actions (e.g., removals).

An outline of the narrative report is presented in Table 2. The report format has been adopted from the Interim Version of "Guidance for Performing Site Inspections Under CERCLA", November 1991 (DRAFT).

6.0 SCHEDULE

An estimated project schedule outlining specific work tasks is provided as Figure 12. The project schedule, which adheres to report review and comment period scheduling requirements of the FFA, assumes the following:

- a 4 week mobilization period following approval of the final Work Plan,
- a 4 week turnaround time for receipt of laboratory analytical data,
- a 4 week turnaround time for completion of laboratory data validation,
- submit draft SASE report 3 months after receipt of validated data,
- a 45 day period for EPA and RIDEM review of the draft SASE report,
- a 45 day period for Navy review and response to comments on the draft SASE report,
- a 45 day period for meetings to resolve draft SASE report issues and for Navy to submit draft final report,
- a 30 day period for EPA and State Letter of Concurrences with draft final SASE report,
- and a concurrent 60 day period for Navy issuance of the final SASE report.

As shown on Figure 12, the field sampling activities will begin approximately four weeks following approval of the Work Plan by EPA and RIDEM. It is estimated that field investigations should be completed within approximately ten weeks of initiation, and validated analytical data received at TRC-EC within eight weeks after completion of sampling activities. Copies of all of the validated data reports will be transmitted to the EPA and RIDEM after an initial review by TRC-EC. The draft Study Area Screening Evaluation (SASE) Report, which will document the investigation activities and summarize findings for each of the three study area investigations is estimated to be completed within approximately three months of receiving all validated data.

7.0 REFERENCES

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Loureiro Engineering Associates, May 15, 1986, Confirmation Study Report on Hazardous Waste Sites at Naval Education and Training Center, Newport, RI, prepared for the Northern Division, Naval Facilities Engineering Command.

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TRC Environmental Consultants, Inc., November, 1991, Draft Final Report Remedial Investigation, Naval Education and Training Center, Newport, Rhode Island", prepared for the Northern Division, Naval Facilities Engineering Command.

U.S. Environmental Protection Agency, Guidance for Performing Site Inspections under CERCLA, Interim Version, November 6, 1991.

- TABLES -

Introduction and Project Background

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TABLE 1
IAS RECOMMENDATION SUMMARY

Study Area No. and Name	*IAS Recommendation*	*Confirmation Study*
01 - McAllister Point Landfill	*Further Study*	*Yes*
02 - Melville North Landfill	*Further Study*	*Yes*
04 - Coddington Cove Rubble Fill Area	*No Further Action*	*No*
05 - Melville North Area	*Further Study*	*No*
06 - STP Sludge Drying Bed	*Further Study*	*No*
07 - Tank Farm One	*Further Study*	*Yes*
08 - NUSC Disposal Area	*No Further Action*	*No*
09 - Old Fire Fighting Training Area	*No Further Action*	*No*
10 - Tank Farm Two	*Further Study*	*No*
11 - Tank Farm Three	*Further Study*	*No*
12 - Tank Farm Four	*Further Study*	*Yes*
13 - Tank Farm Five	*Further Study*	*No*
14 - Gould Island Disposal Area	*Further Action*	*Yes*
15 - Gould Island Bunker 11	*Further Action*	*No*
17 - Gould Island Electroplating Shop	*Further Action*	*Yes*
18 - Structure 214	*Further Action*	*No*

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TABLE 2
NARRATIVE REPORT OUTLINE

INTRODUCTION

State the purpose, scope, and objectives of the SASE.

SITE DESCRIPTION AND REGULATORY HISTORY

Identify the type of site (e.g., plating facility, tank farm, disposal area), whether it is active or inactive, and years of operation. Describe its physical setting (e.g., topography, local land uses). Include the appropriate portion of a USGS 7.5-minute topographic map locating the site and showing a 1-mile radius. On the map, identify the surface water drainage route; nearest well, drinking water intake, and residence; wetlands and other sensitive environments. Include a drafted sketch showing site layout, source areas, and features on and around the site.

Briefly summarize dates and scope of previous investigations (Initial Assessment Study, Confirmation Study, etc.).

Describe prior land use operations and past regulatory activities including the site's RCRA status, permits, permit violations, and inspections by local, State, or Federal authorities. Discuss any citizen complaints.

Describe the site land use prior to the reported site activities as described or presented in historical documents, aerial photos, and/or maps. Any noted physical/geographical land alterations which appear to have occurred as a result of or after reported site operations will be discussed.

OPERATIONAL HISTORY AND WASTE CHARACTERISTICS

Provide an operational history of the site, and describe site activities. Identify and describe wastes generated, waste disposal practices, waste source areas, waste source containment, and waste quantities (indicate source areas on the site sketch).

Discuss any previous sampling at the site; provide dates of sampling events and sample types. Summarize analytical results in a table. Include a site map of previous sample locations.

Discuss SASE source sampling results. List in a table each waste source sample and summarize analytical results. Include a site map of waste source sample locations.

Ground Water

Describe the local geologic and hydrogeologic setting (e.g., stratigraphy, formations, aquifers, depth to the shallowest aquifer).

Discuss ground water use in vicinity of the sources. Identify the nearest drinking water wells and state the distance from sources. Quantify drinking water populations served by wells in the area, differentiating between private and municipal wells.

Discuss any previous ground water sampling; provide dates of sampling events and the depths.

Discuss SASE ground water sampling results. List in a table each sample and summarize analytical results. (Include a site map of sample locations.) Identify drinking water wells exposed to hazardous substances and quantify the drinking water populations.

Discuss the potential for any discovered contaminant migration from the site via the ground water.

Surface Water

Describe the local hydrologic setting, including site location with respect to floodplains, and the overland and in-water segments of the surface water migration path. State the distance from the site to the probable point of entry into surface water. Include a drafted sketch of the surface water migration path. Describe upgradient drainage areas, on-site drainage (including storm drains, ditches, culverts, etc.), facility discharges into surface water, permits, and historical information.

Indicate whether surface water within the in-water segment supplies drinking water. Identify the location and state the distance from the probable point of entry to each drinking water intake. Quantify the drinking water population served by surface water.

Indicate whether surface water within the in-water segment contains fisheries.

Indicate whether surface water is used for any recreational purposes and any related concerns.

Indicate whether sensitive environments are present within or adjacent to the in-water segment. Identify and state the frontage length of wetlands on surface water.

Discuss any previous surface water sampling.

Discuss the potential for any discovered contaminant migration from the site via the surface water.

- Discuss SASE surface water sampling results. List in a table each sample and summarize analytical results. Identify surface water intakes exposed to hazardous substances and quantify the drinking water populations served by each. Identify fisheries exposed to hazardous substances. Identify sensitive environments and wetlands exposed to hazardous substances; quantify the frontage of exposed wetlands.

Soil Exposure

State the number of on-site workers and the number of people who live on site and within 200 feet of an area of significant or elevate concentrations with respect to MCLs, permit levels, etc.

Identify terrestrial sensitive environments on an area of observed contamination.

Discuss any previous sources and surficial soils sampling.

Discuss SASE surficial source samples and off-site surficial soil samples. List each sample in a table and summarize analytical results.

Discuss the potential for any discovered contaminant migration from the site via the soil medium.

Air

Identify potential receptors.

Discuss any previous air sampling.

Discuss SASE air sampling results.

Discuss the potential for any discovered contaminant migration from the site via the air medium.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND RISK EVALUATION

Compare sampling results to ARARs.

Evaluation of site risks to potential human and sensitive environmental concerns.

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

- Briefly summarize the major aspects of each site and its history that relate to the release of hazardous substances and the exposure potential receptors. Briefly summarize principal pathways and receptors of concern.

  Summarize sampling results, including substances detected in environmental media.

- Recommendation for no further action, additional site investigations, or limited response actions (e.g., removal), where appropriate.

PHOTODOCUMENTATION LOG

As an attachment, provide photographs of the site and pertinent site features taken during the SASE. Useful photographs illustrate waste source areas, containment conditions, stained soil, stressed vegetation, drainage routes, and sampling locations. Describe each photograph in captions or accompanying text. Key each photo to its location on the site sketch.

REFERENCES

List all references cited in the SASE report.

Attach copies of references cited in the SASE report, if appropriate.

- FIGURES -

Introduction and Project Background

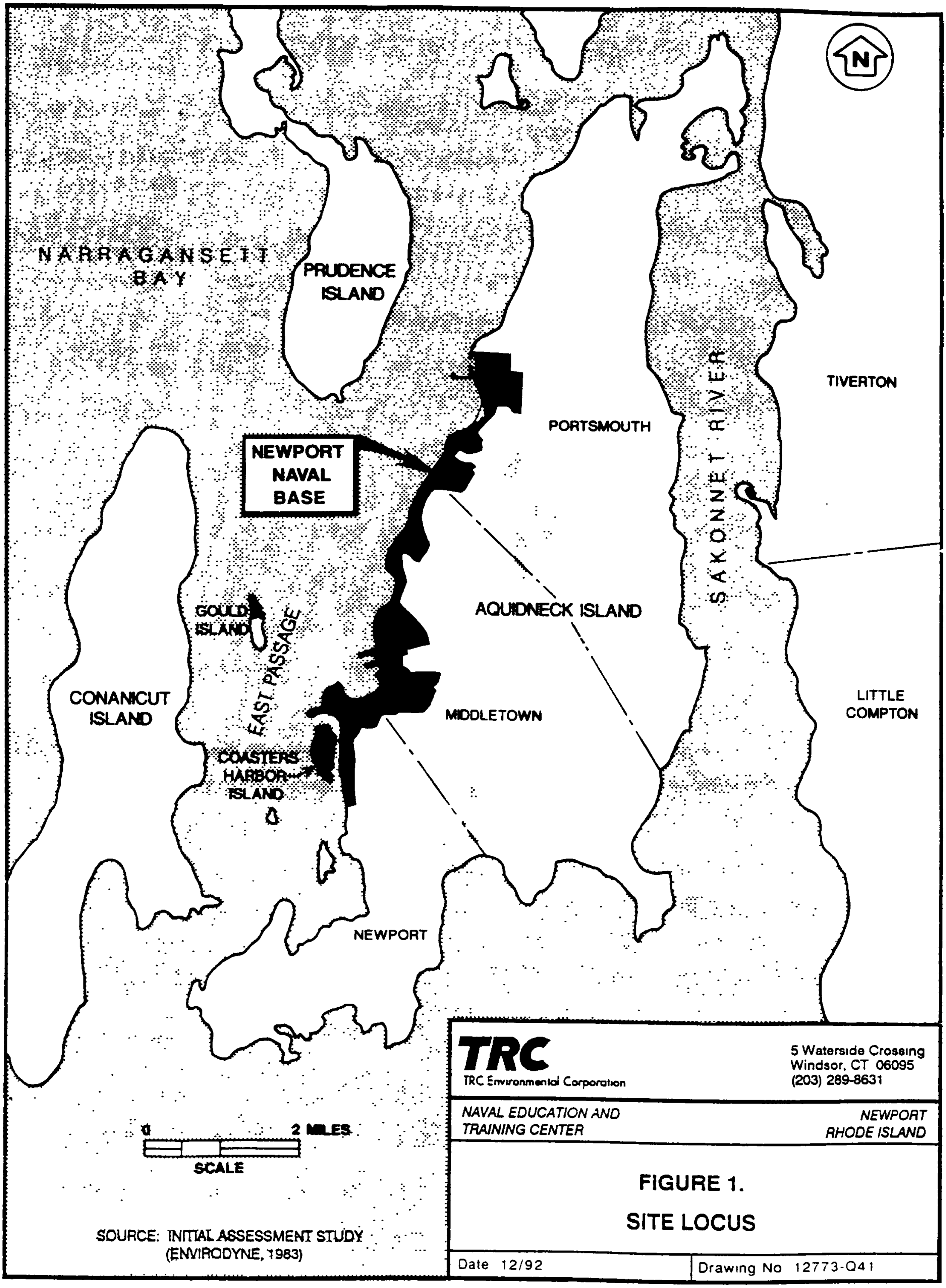

FIGURE 1.
SITE LOCUS

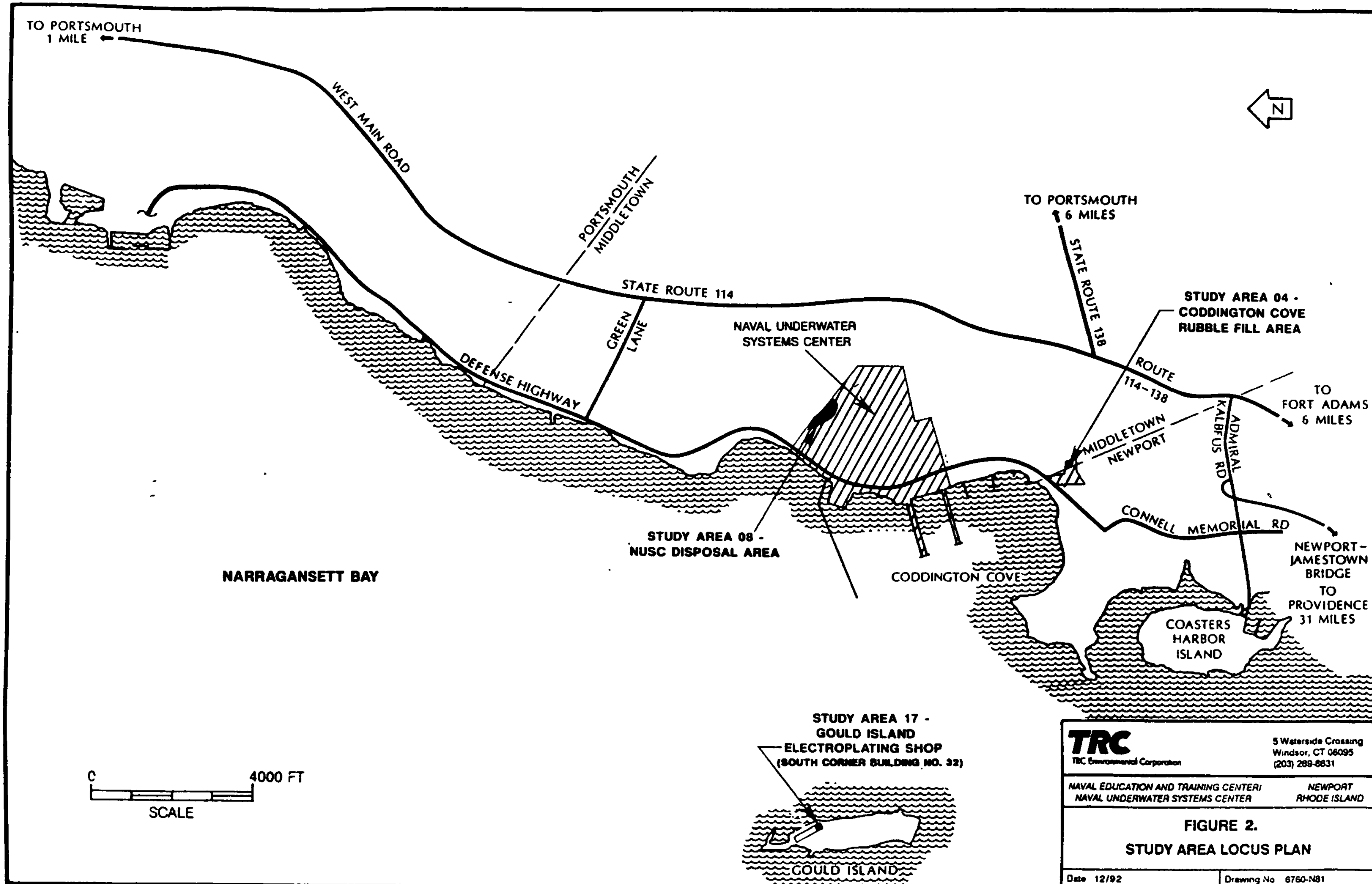

FIGURE 2.

STUDY AREA LOCUS PLAN

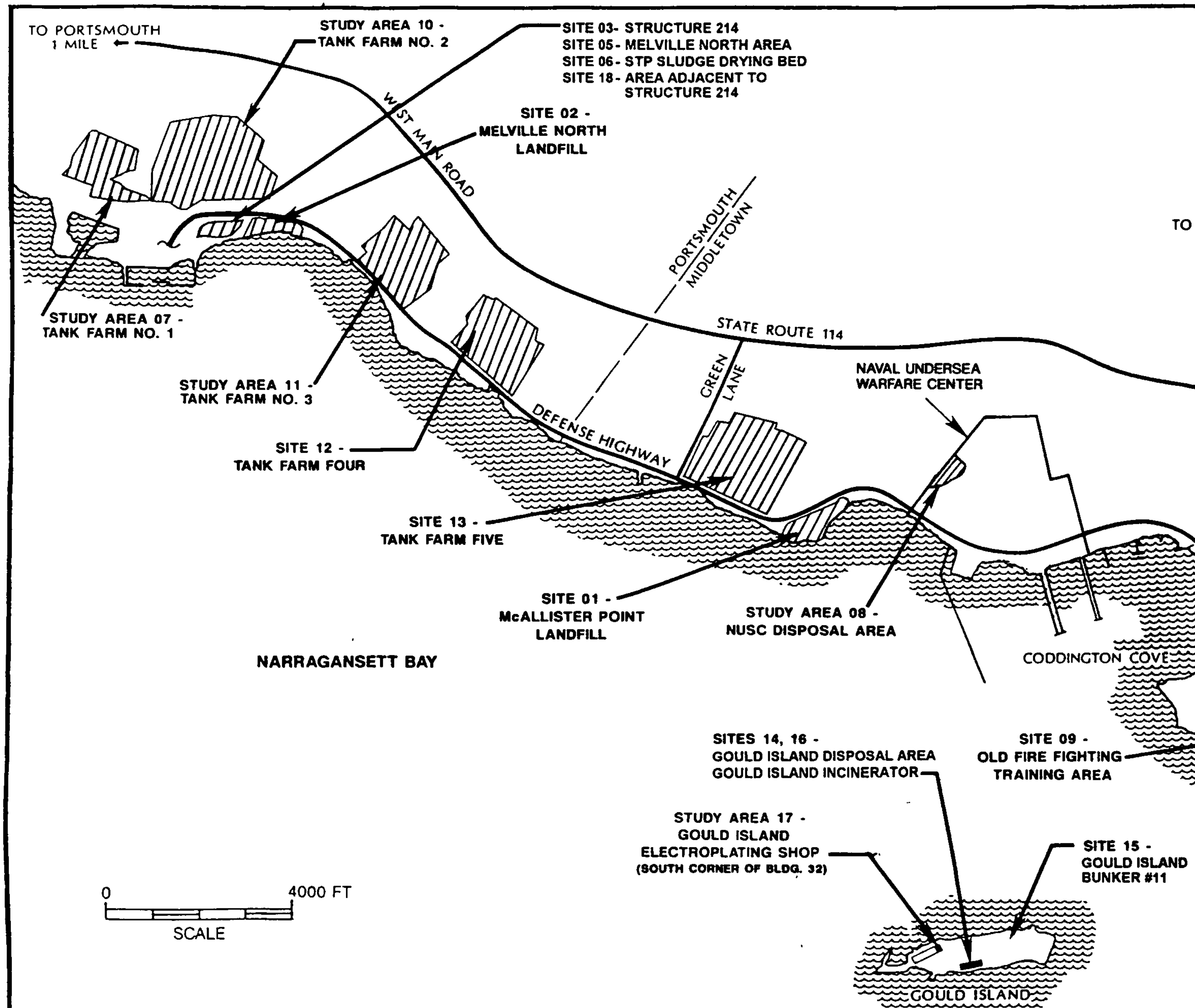

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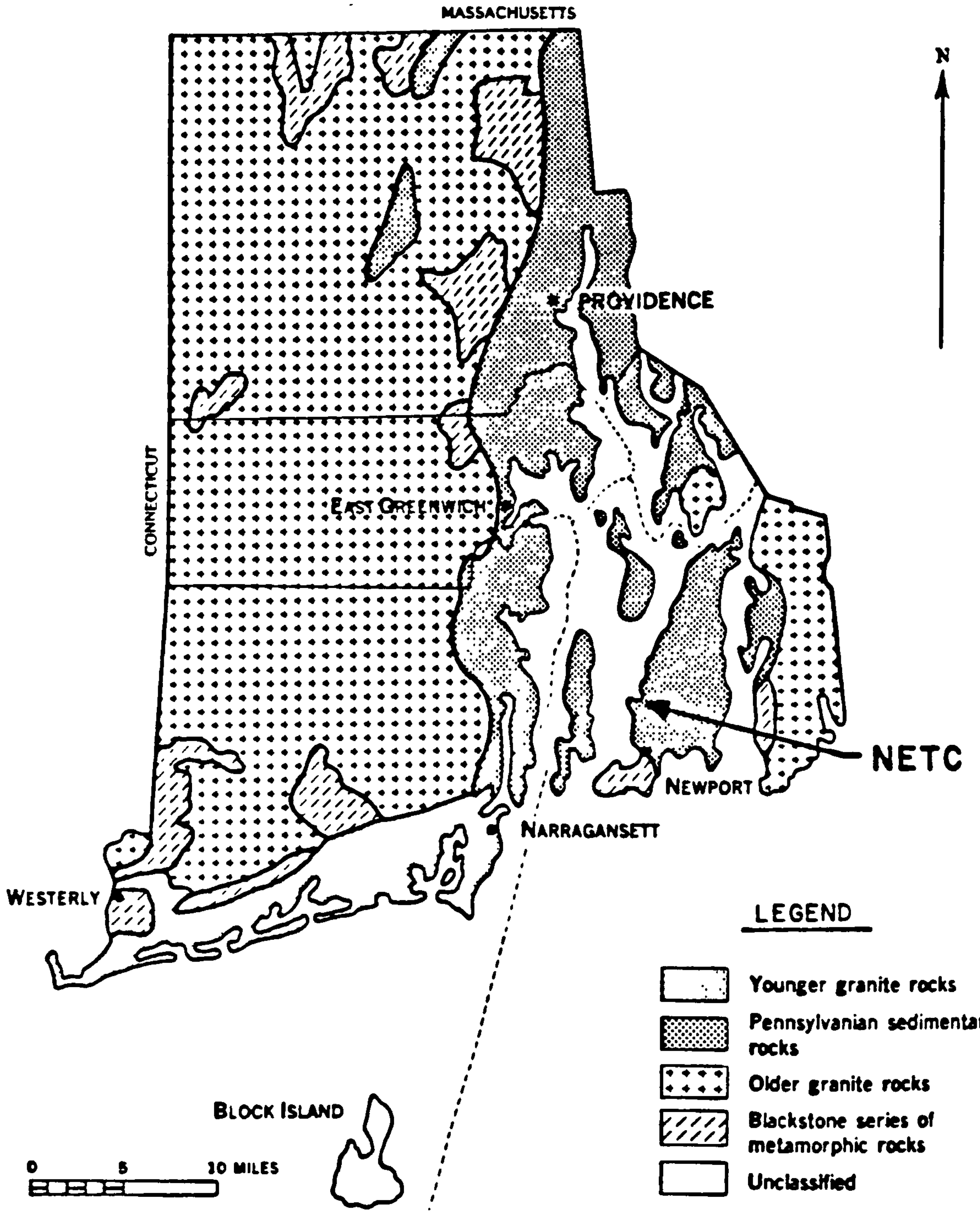
FIGURE 3.

HAZARDOUS WASTE SITES LOCUS PLAN



SOURCE: FIGURE 5.3-2 OF 1983 IAS REPORT (ENVIRODYNE)

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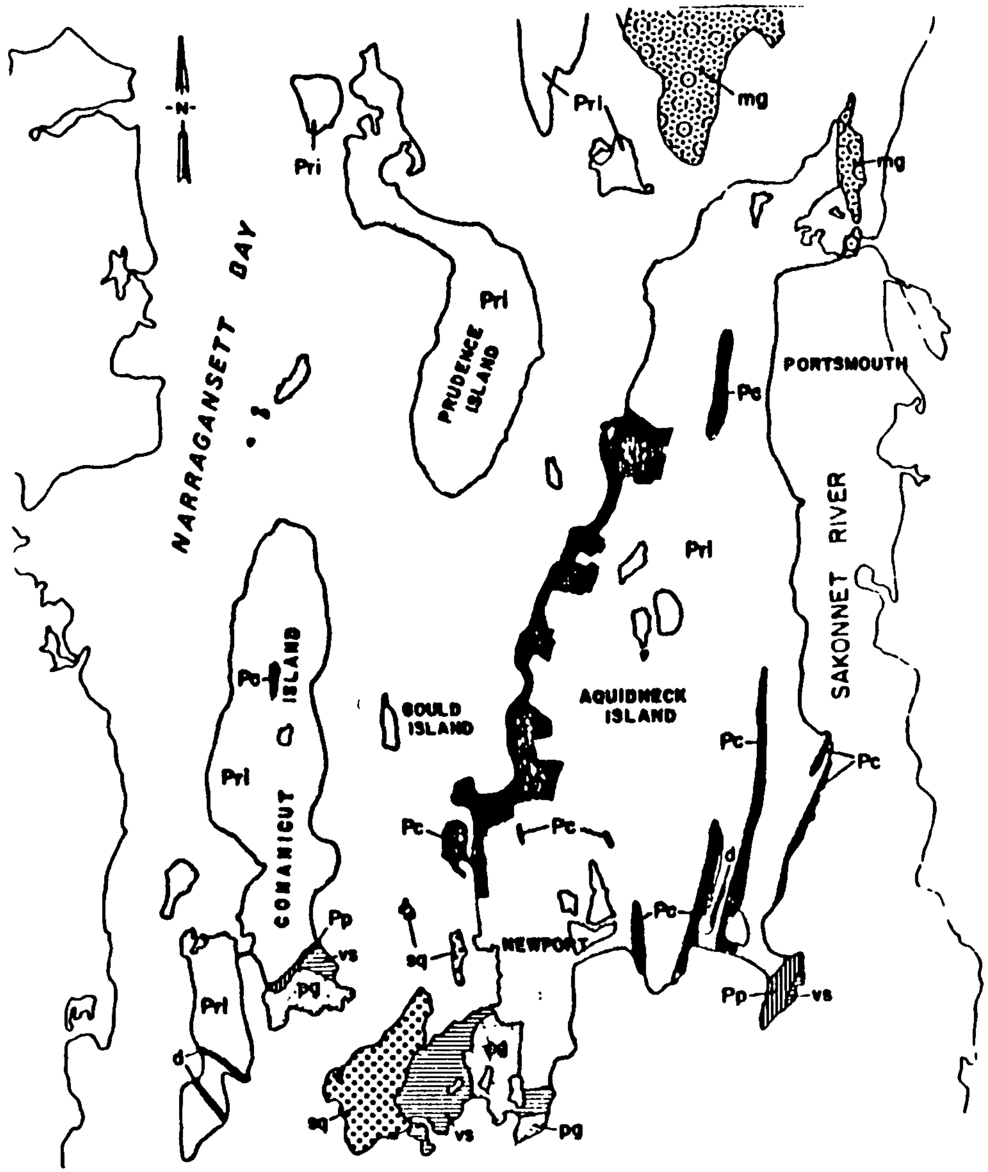
FIGURE 4.

GENERAL GEOLOGIC MAP OF RHODE ISLAND

Date 4/92

Drawing No 6760-N81



SOURCE: FIGURE 5.3-3 OF 1983 IAS REPORT (ENVIRODYNE)

Mafic dikes and sills

d- - Dark-gray to black, fine-grained dikes and sills, in widely different parts of Rhode Island. Several are diabase and olivine diabase; a few are lamprophyres; some are altered and may be pre-Pennsylvanian; most are a foot or a few feet thick and are exposed for only a few feet.

Rhode Island Formation

Pri - Gray to dark-gray, fine- to coarse-grained sandstone and lithic graywacke, and dark-gray to black shale; also includes conglomerate and meta-anthracite; crossbedding and irregular discontinuous bedding characteristic; plant fossils abundant in a few places; in southwest includes quartz-mica schist, feldspathic quartzite, garnet-staurolite schist, and quartz-mica-sillimanite schist.

Pc - Gray coarse conglomerate, with pebbles, cobbles, and boulders chiefly of quartzite, interbedded with gray coarse-grained, crossbedded sandstone and lithic graywacke; pebbles and boulders much elongated in southeastern Rhode Island.

Pondville Conglomerate

Pp - Light-gray to gray or greenish, coarse- to fine-grained conglomerate, with irregularly interbedded sandstone and lithic graywacke; gray granule conglomerate in southeast; present discontinuously at margins of Narragansett basin.

Porphyritic Granite at Newport and Conanicut Island

pg - Grayish-pink to grayish-green, coarse-grained porphyritic granite, large phenocrysts of microcline and microperthite; main constituents are microperthite, microcline, albite, quartz, hornblende, biotite, chlorite, and epidote.

Metacom Granite Gneiss

mg - Gray to pink, medium-grained granite gneiss, locally porphyritic; lineated with streaks of biotite, locally foliated, consists chiefly of microcline and microperthite, albite, quartz, biotite, and muscovite; small aplite dikes and quartz veins common.

Volcanic Tuff, Conglomerate and Quartzite of Newport Vicinity

vs - Mostly dark-gray, dense flinty to fine-grained, felsic metavolcanic rocks that weather light gray to greenish gray; probably contains tuff, lapilli tuff, volcanic sandstone and volcanic siltstone; some more massive beds may be flows. Some conglomerate beds near base, as much as 50 feet thick, contain pebbles of quartzite, quartz, granite and volcanic rocks; a few thin lenses of white to gray marble near base.

Slate and Quartzite of Newport Vicinity

sq - Greenish-gray, green, gray-green, purplish-red, and reddish-purple alternating thin beds of slate and fine- to coarse-grained quartzite; quartzite commonly has cross bedding and graded bedding. Locally thin beds of conglomerate, light-gray quartzite, and lenses of fine-grained marble.

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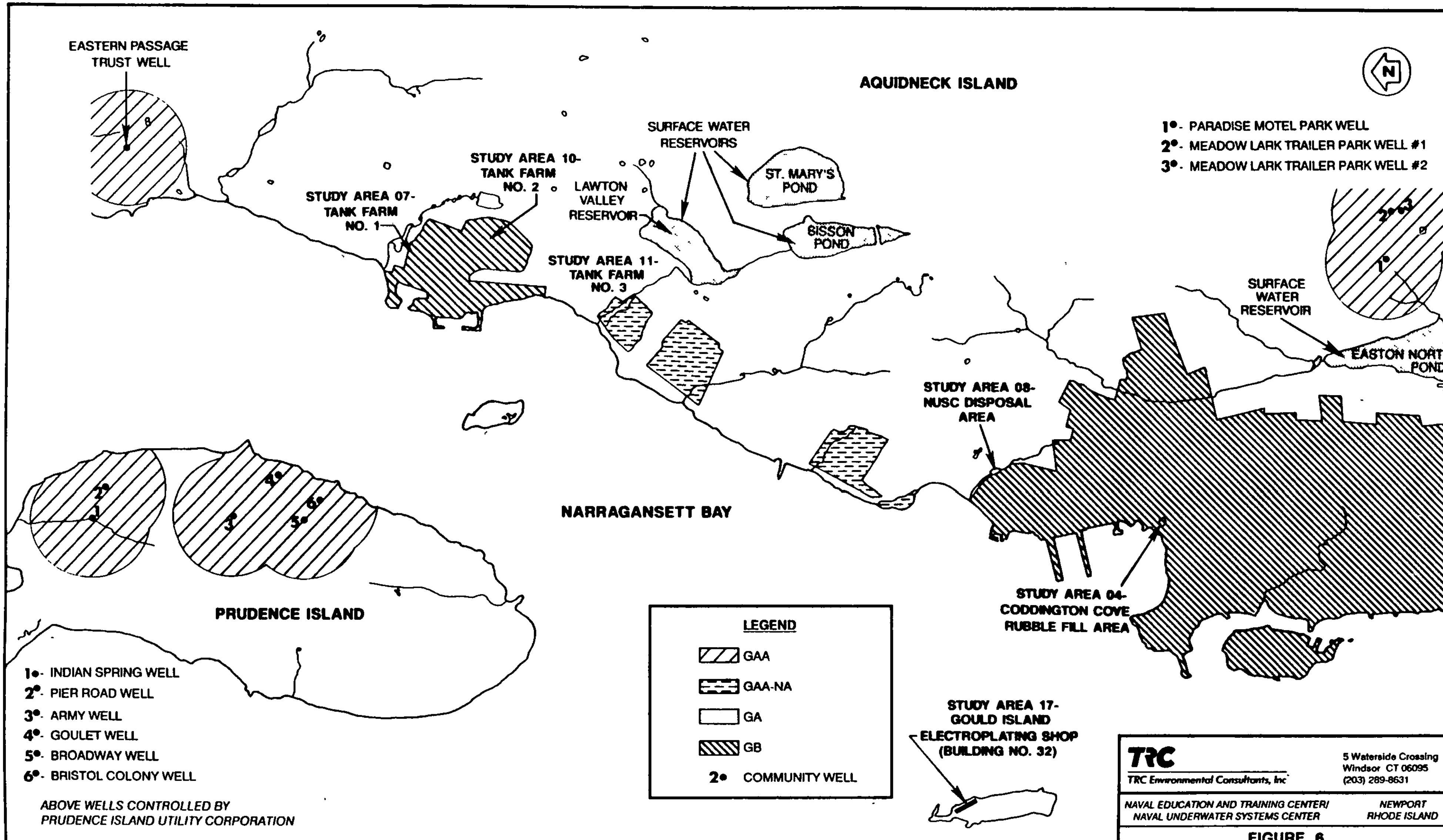
FIGURE 5.
BEDROCK GEOLOGIC MAP OF NETC AREA

Date: 4/92 | Drawing No. 6760-N81



NOTES I SOURCE=RHODE ISLAND DEM GROUNDWATER CLASSIFICATION OVERLAY MAP PRUDENCE ISLAND QUADRANGLE

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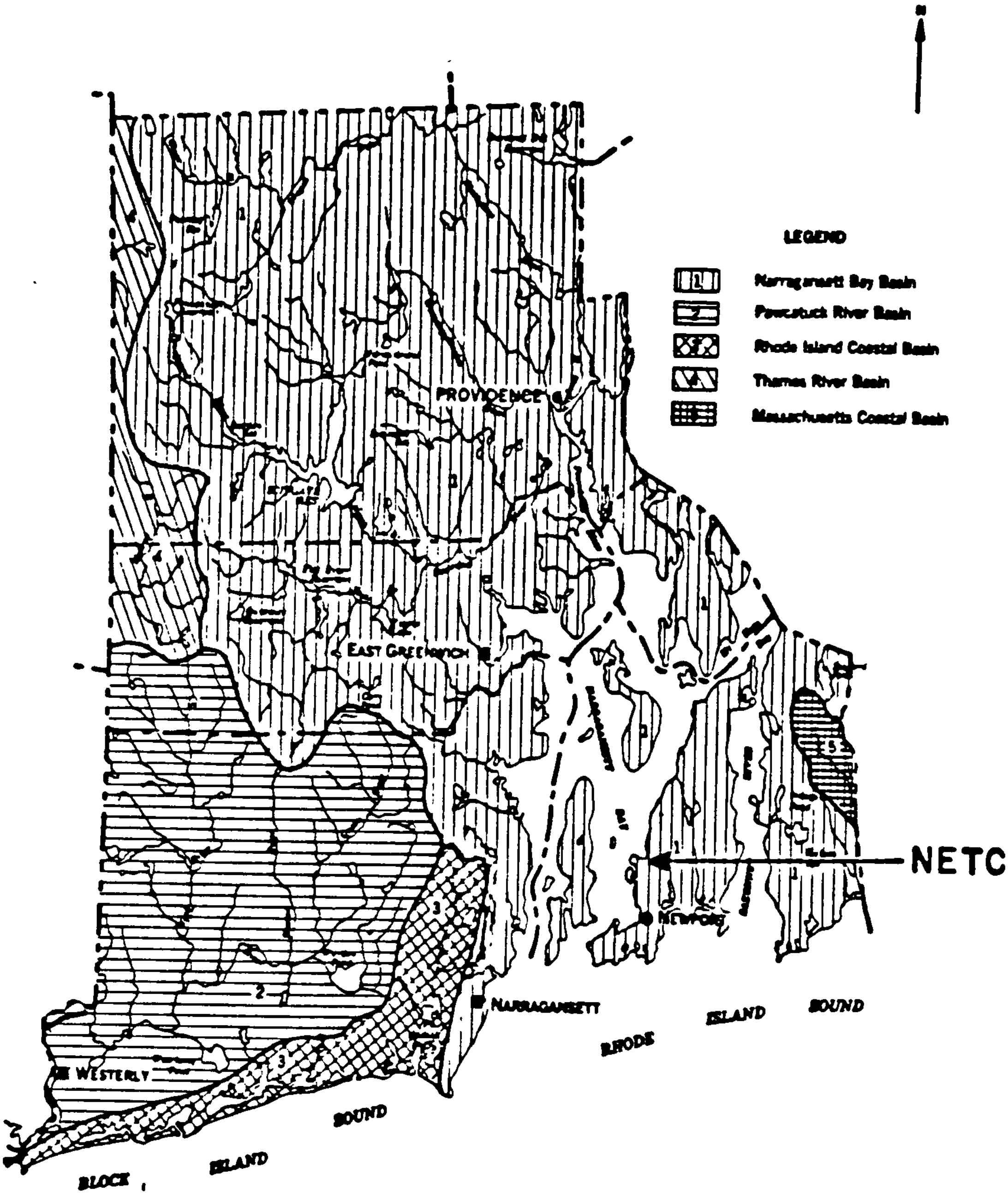
FIGURE 6.

GROUNDWATER CLASSIFICATION AND WATER USE MAP

Date 4/92 | Drawing No 6760-N81



SOURCE: FIGURE 5.3-5 OF 1983 IAS REPORT (ENVIRODYNE)

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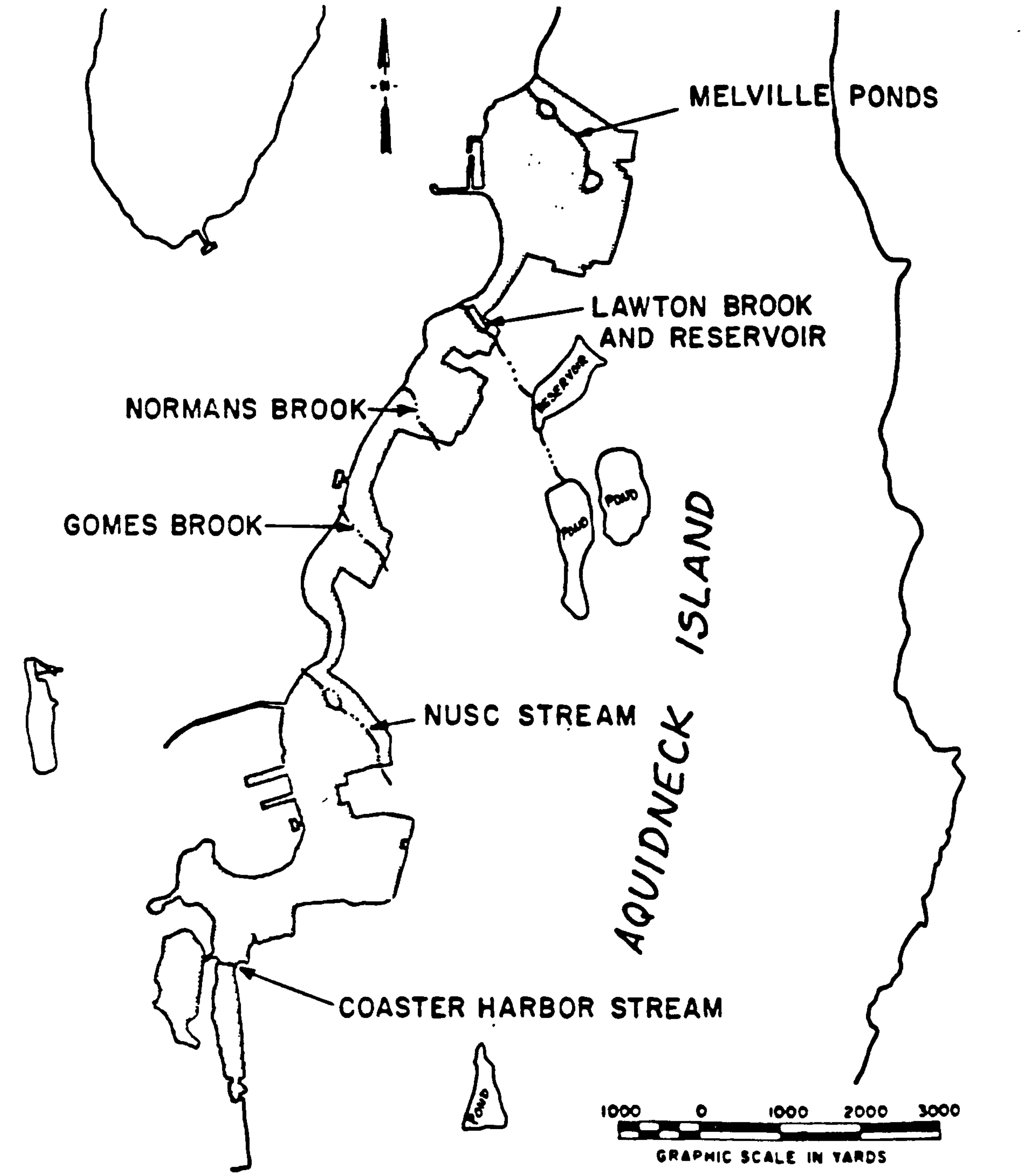
FIGURE 7.
RHODE ISLAND DRAINAGE BASIN MAP

Date: 4/92 | Drawing No. 6760-N81



SOURCE: FIGURE 5.3-6 OF 1983 IAS REPORT (ENVIRODYNE)

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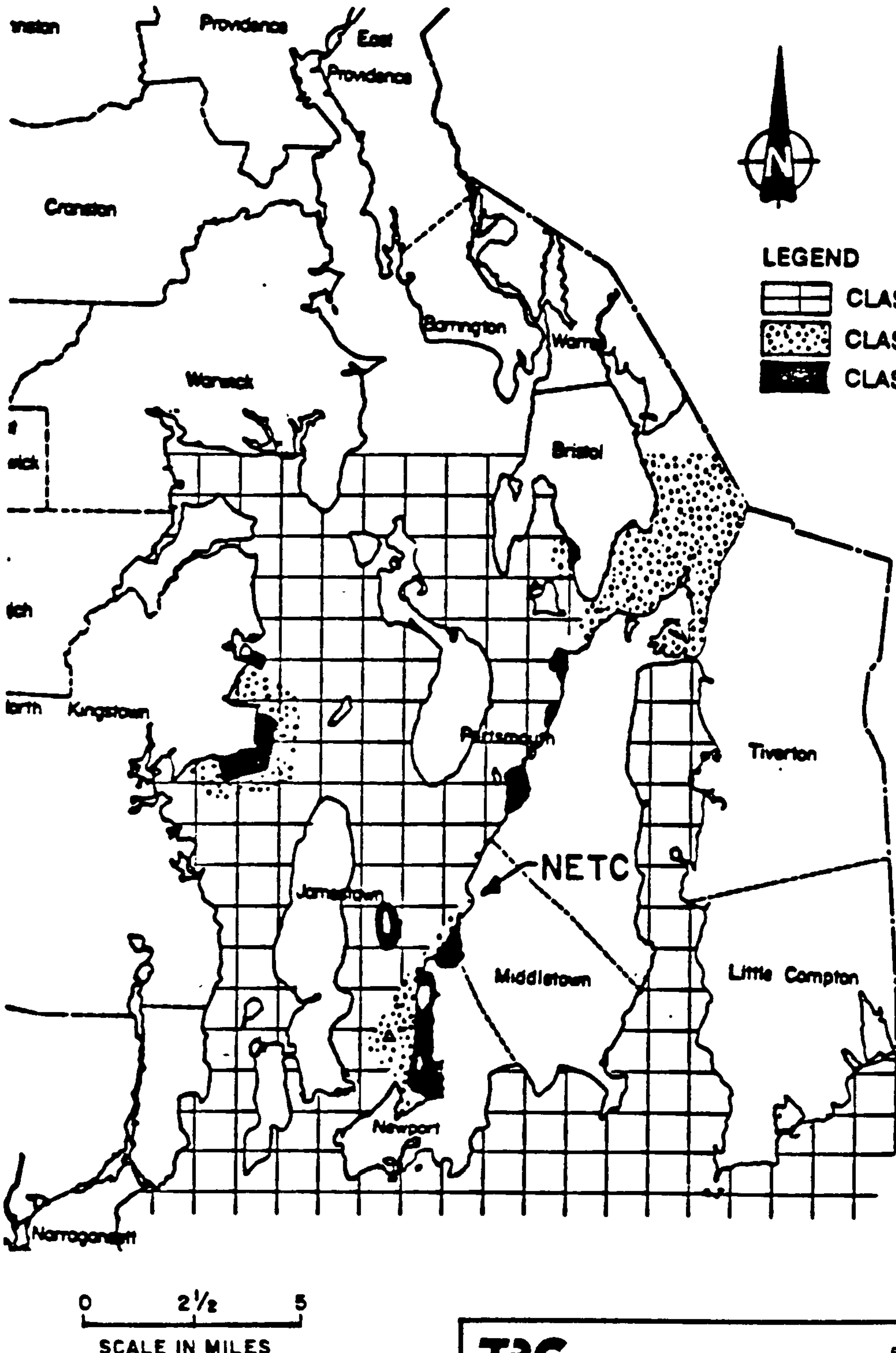
FIGURE 8.
NETC SURFACE DRAINAGE MAP

Date. 4/92

Drawing No 6760-N81



SOURCE: FIGURE 5.3-8 OF 1983 IAS REPORT (ENVIRODYNE)

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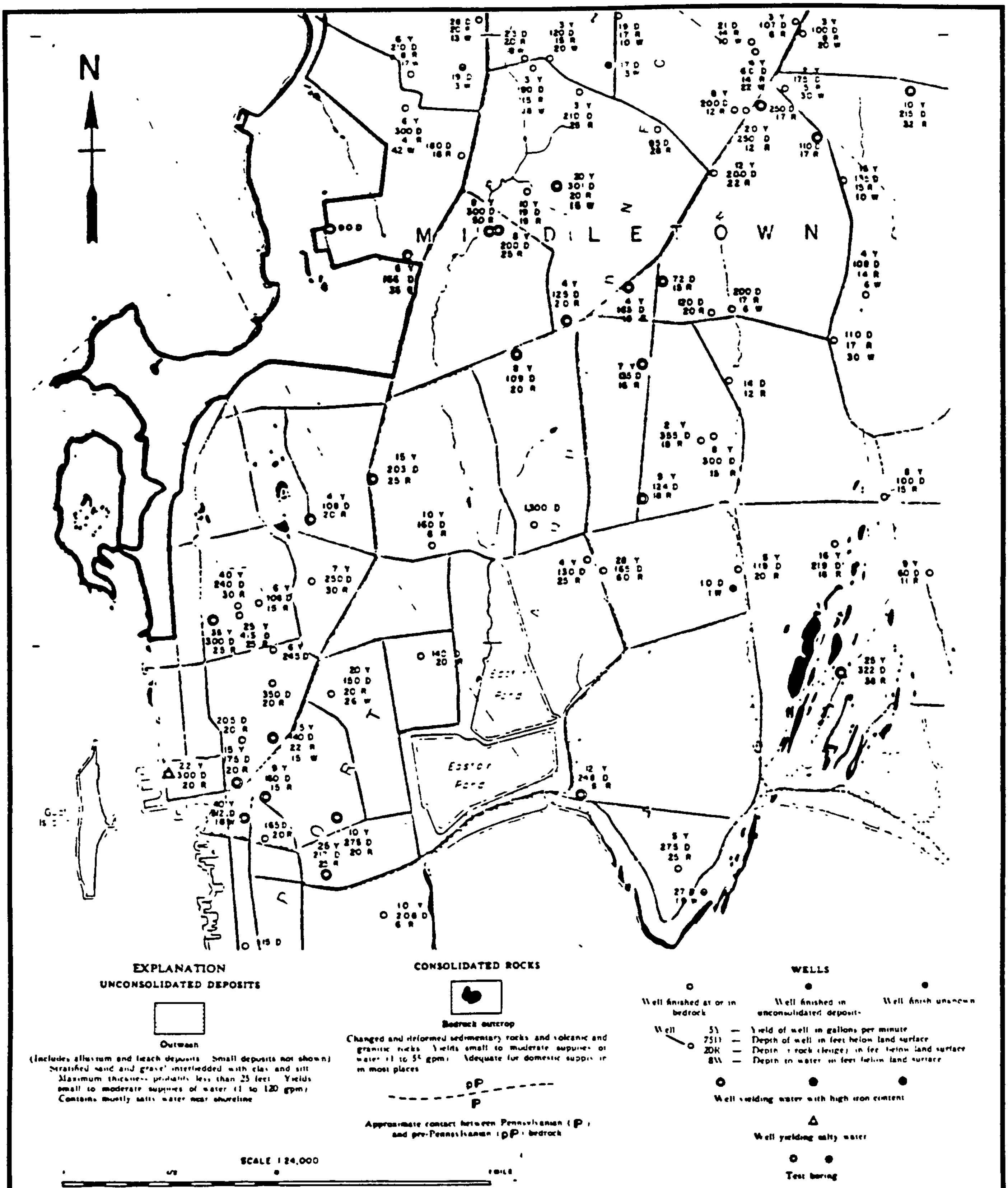
FIGURE 9.

SURFACE WATER QUALITY MAP OF NARRAGANSETT BAY

Date. 4/92

Drawing No 6760-N81



SOURCE: FIGURE 5.3-9 OF 1983 IAS REPORT (ENVIRODYNE)

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FIGURE 10.

BEDROCK WELL MAP A

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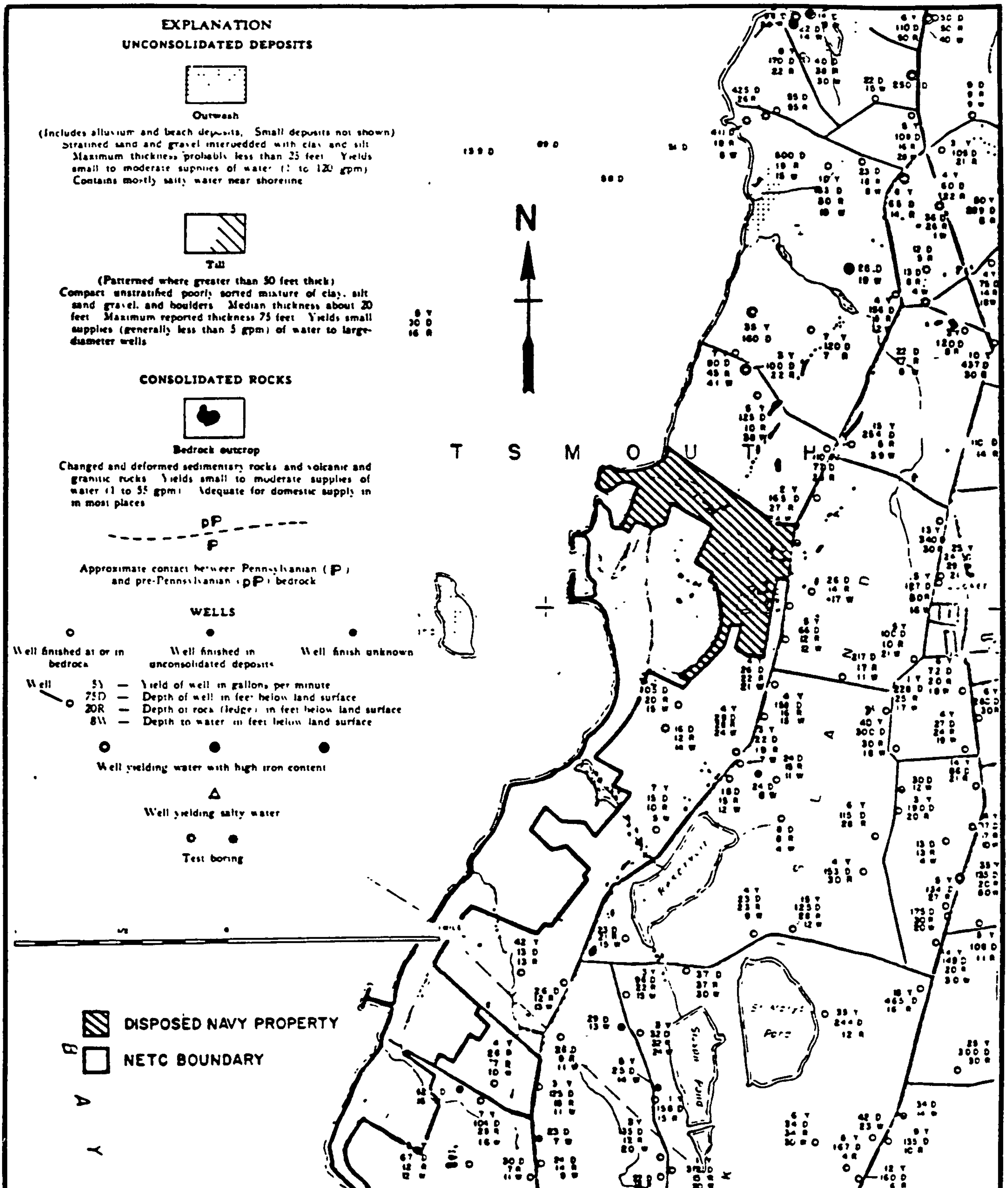

SOURCE: FIGURE 5.3-10 OF 1983 IAS REPORT (ENVIRODYNE)

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FIGURE 11.

BEDROCK WELL MAP B

Date 4/92 | Drawing No. 6760-N81

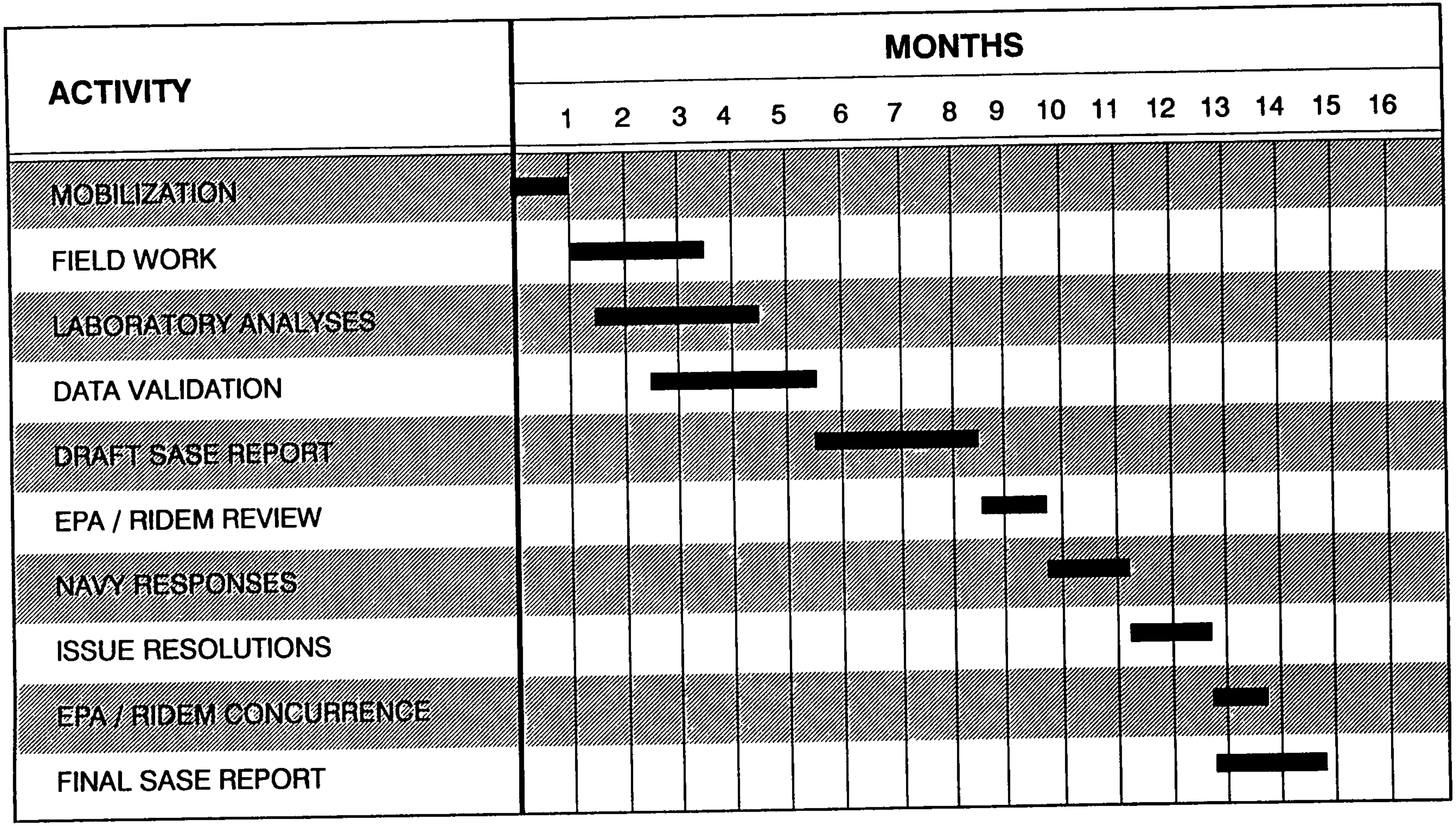

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FIGURE 12.

PROJECT SCHEDULE

Date: 7/92 | Drawing No.: 6760-N81

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

VOLUME I
-CODDINGTON COVE RUBBLE FILL AREA-
STUDY AREA 04

STUDY AREA SCREENING EVALUATION
WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

TRC Environmental Corporation

TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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TABLE OF CONTENTS

VOLUME I - CODDINGTON COVE RUBBLE FILL AREA

TABLE OF CONTENTS Cont'd.

VOLUME I - CODDINGTON COVE RUBBLE FILL AREA

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The objective of this volume of the Work Plan is to define the level of investigation necessary to assess the presence and nature of environmental contamination at Study Area 08, the Coddington Cove Rubble Fill Area site located on the NETC. This volume of the Work Plan describes site-specific objectives in Section 1.1, summarizes available site background information in Section 2.0, presents the site-specific field sampling plan in Section 3.0, and summarizes site-specific health and safety information in Section 4.0.

1.1 SITE-SPECIFIC INVESTIGATION OBJECTIVES

Currently available information (as presented in the IAS report) suggests that the Coddington Cove Rubble Fill area does not pose a threat to human health or the environment. The Initial Assessment Study (IAS) performed on the site in 1983 concluded that no further action was required at this site.

Project objectives for this site are to verify the reported types of materials disposed of on the site and if any contamination is present as a result of such disposal. The investigation will assess the presence of any releases of hazardous substances to soil and ground water through a focused program of investigation. The investigation activities will include geophysical and soil gas surveys, test pits, monitoring well installation, and the collection and analysis of surface water, soil, and ground water samples, as described in Section 3.0.

Given the limited amount of available site background information, a relatively thorough investigation is planned to document the suspected absence of any environmental contamination and potential threats to human health and the environment. If the site investigation findings support this hypothesis, no further investigation or monitoring would be proposed for this site. However, if the findings of the site investigations indicate the presence of site-related environmental contamination, additional investigation activities and/or limited response actions (e.g., removals) may be conducted at the site.

2.0 SITE BACKGROUND INFORMATION

2.1 SITE LOCATION

The Coddington Cove Rubble Fill Area is located in the central portion of NETC, just east of Coddington Cove. The location of the Coddington Cove Rubble Fill Area, relative to the other study areas within the Newport Naval Base, is shown on Figure 1. A U.S. Navy existing conditions map of the Coddington Cove area is provided in Appendix A. According to the IAS report (Envirodyne Engineers, 1983) the reported location of the Coddington Cove Rubble Fill Area is southwest of Building No. 47 and adjacent to the Coddington Highway. The site is bisected by the City of Newport/Middletown corporate boundary.

West of the site is a low lying wet area and the Defense Highway, followed by a narrow strip of land and Narragansett Bay. The location and extent of this low lying wet area will be surveyed under the field investigation activities. North of the site is a small parking area, Building No. 47 and an associated open storage area. To the south is Coddington Highway followed by Naval housing, and vacant land. To the east is Coddington Highway, a motel, and Naval housing.

2.2 SITE DESCRIPTION

The Coddington Cove Rubble Fill Area occupies approximately five to eight acres. The site is surrounded by a chain link fence. The site is best described as an overgrown low lying area. Site vegetation consists of heavy brush, weeds and other low growing (approximately three to five feet) vegetation.

In general, the site topography is uneven, as is typically the case for such a filled area. Topographic relief across the study area is generally limited to five feet or less. Narragansett Bay is located approximately 700 feet northwest of the site. Site features are shown on Figure 2.

2.2.1 Site Observations

On March 25, 1992, TRC-ECI personnel visited the subject study area. Significant observations during the site visit included the following:

- Study area topography was uneven, as typical of filled areas. A mounded area was observed in the central portion of the site. In general, study area features were obscured by vegetative cover.
- Much of the area surrounding the study area is best characterized as a low lying wet area overgrown by heavy brush and vegetation.
- In general, observations were limited by the lack of physical access onto the site due to the presence of fencing and the heavy vegetative cover present. However, no obvious evidence of vegetative stress or disposal of suspect materials was observed from the parking area located directly southeast of Building No. 47.

2.3 PREVIOUS SITE INVESTIGATIONS AND HISTORY

The Initial Assessment Study (Envirodyne Engineers, 1983) identified areas on NETC where potential contamination from past waste disposal or handling practices may pose human health or environmental risks. The Coddington Cove Rubble Fill Area was reviewed under the IAS.

Relatively little information was provided on the Coddington Cove Fill Area in the IAS. However, the report did indicate that this area was used for disposal of concrete, asphalt, slate, wood, brush, and small quantities of ash from approximately 1978 until 1982. The IAS report indicated that demolition type materials were no longer being disposed of at the site.

2.3.1 Aerial Photography

Aerial photographs dating from 1942, 1951, 1963, 1965, 1970, 1975, 1981, and 1988 were reviewed at the Rhode Island Department of Administration, Division of Planning. Below is a summary of observations made during the review of the photographs. Figure 3 shows the site locations of significant aerial photo observations.

The 1942 aerial photo indicated the presence of a small ponded area west of the future (i.e., not yet present) Coddington Cove Rubble Fill area, adjacent to Defense Highway. Building No. 47 and its associated open storage area are not present in the 1942 photo. There is no evidence of land use or disturbed soils in the vicinity of the future fill area.

The 1951 coverage shows a man-made ditch or swale northwest of the small ponded area observed on the 1942 photo. Evidence of light colored soils, possibly fill material, and soil mounds are present northwest of the pond, in the approximate area of the site. Similar site features were observed in 1963 aerial photography.

The 1965 coverage indicated numerous individual mounds of light colored material, possibly fill or rubble, on the site. In addition, the presence of several roughly circular dark areas, possibly ponded areas, were located along the western edge of a light colored area. An access road to the site was present leading from the southern border of the site to Coddington Highway. There also appeared to be a drainage ditch to the north and east of the fill area.

The previously observed mounded materials were also observed on the 1975 aerial coverage. Access roads were observed both south and northeast of the fill area from 1970 until 1981. In 1988 only the southern access road is apparent. The 1970 through 1981 coverage shows the previously observed drainage ditch connected to a ponded or low-lying wet area located to the north of the fill area. The 1988 coverage shows a less pronounced pond area with more vegetative cover over the northeastern portion of the fill area.

2.4 SITE HYDROGEOLOGY AND GEOLOGY

No site-specific hydrogeologic or geologic information is available on the Coddington Cove Rubble Fill Area. However, based upon the area topography and other NETC site hydrogeologic information, site ground water flow is anticipated to be to the northwest towards Narragansett Bay. The soil types at this site are anticipated to consist of fill materials and organic mucks.

The Coddington Cove Rubble Fill area is located within a Rhode Island DEM Class GB ground water setting. The Paradise Motel Park well is the closest known public ground water supply well. This well is located approximately 2.4 miles southwest of the site, in the assumed upgradient ground water direction. The closest surface water reservoir is the Easton North Pond, located approximately 1.5 miles south-southeast of the site in the assumed upgradient ground water direction. The location of these features relative to the site is shown in Figure 6 of the Project Introduction and Background volume of this Work Plan.

2.5 SITE WASTE CHARACTERISTICS

Historical information (IAS, 1983) indicates disposal of the following materials at the Coddington Cove Rubble Fill Area:

- Concrete,
- Asphalt,
- Slate,
- Wood,
- Brush, and
- Ash.

In addition, granular fill material was apparently placed within this area as indicated by historic aerial photographs. Waste characteristics typical of rubble/soil fill areas, namely, heterogeneous composition and irregular densities are anticipated. Based on the suspected disposal of ash materials at the site, chemical hazards may include heavy metals. The disposal of organic debris may also result in natural decomposition products such as methane.

3.0 SAMPLING PLAN

3.1 INTRODUCTION

The program of investigation described in this section has been developed to achieve both overall and site-specific objectives. Field sampling methodology for individual investigation activities (e.g., soil gas survey, surface soil sampling) is described in Appendix B. The quality assurance/quality control procedures for field sampling and laboratory analyses are presented in the project Quality Assurance Project Plan (QAPP) provided in Appendix D. A summary of the Coddington Cove Rubble Fill Area sampling program is presented as Table 1. The planned site survey and sample locations are shown on Figures 4 and 5, respectively. The rationale for the sampling locations is provided in Tables 4 through 7.

3.2 RECONNAISSANCE SURVEYS

Prior to initiating sampling activities a site walkover will be conducted by TRC sampling team members to familiarize themselves with study area conditions. The site will be visually surveyed with respect to access restrictions, sampling locations, and establishment of appropriate survey grids. Study area specific health and safety considerations, including emergency evacuation procedures, will be reviewed. Pertinent features, such as overhead and subsurface utilities, and other potential hazards will be reviewed with Navy personnel with respect to affected sampling activities.

Following completion of the walkover survey, an air and radiological survey will be conducted at this site. This survey will be conducted on an approximately 50-foot square grid pattern as indicated on Figure 4. The ambient air survey will be conducted with either a flame or photo-ionization detector to assess ambient conditions for the presence of volatile organic compounds (VOCs). The radiological survey will be conducted with an alpha/beta meter and a gamma meter (sodium iodide scintillation meter) to assess the absence or presence of any radiologic hazards on the site. The ambient air and radiological surveys will be completed using equipment and methods outlined in the Field Sampling Methodology Plan provided as Appendix B of this Work Plan.

If radiation readings above measured general area background values are observed during the surveys, the location(s) of elevated radiation readings will cordoned off for further assessment by a certified health physicist.

3.3 GEOPHYSICAL SURVEYS

Electromagnetic conductivity (EM-31) and magnetometer surveys are planned at this site. Given the suspected type of fill materials (e.g., wire, cables, paint cans) at the site, these surveys will be used to aid in determining the nature and extent of fill at the site. The surveys will be conducted on approximately 50-foot spaced north-south traverses. In addition to recording EM readings at grid points, continuous EM readings will be also observed between grid points. Any EM readings which are observed to significantly deviate from normal (e.g., negatives, highs, lows) between the grid points will also be recorded. The planned location of the geophysical survey traverses is shown on Figure 4.

3.4 SOIL GAS SURVEY

A soil gas survey is proposed at this study area to aid in assessing the presence of subsurface volatile organic compound contamination. The soil gas survey will be conducted on a 100-foot spaced grid pattern across the site. The planned locations of the soil gas points are shown on Figure 4. As is necessary, additional soil gas survey points will be completed around points indicating elevated concentrations of soil gas. Any of the planned soil gas points found to be within any on-site low-lying wet areas (e.g., swales, ditches, ponded areas) will not be performed. The on-site surface water conditions and affected locations of the planned soil gas will be determined just prior to the soil gas survey activities.

As described in the Field Sampling Methodology discussion provided in Appendix B of the Work Plan, soil gas samples will be analyzed in the field with an organic vapor analyzer for total organics and an HNu-311 portable gas chromatograph (GC), or equivalent. The portable GC will be used to identify the individual concentrations of several aromatic and chlorinated volatile organic compounds.

3.5 SOIL SAMPLING

Soil samples will be collected as surface soil samples, well boring samples, and test pit samples under this site investigation. Below is a discussion on each of the planned soil sampling activities.

3.5.1 Surface Soil Sampling

Surface soil samples will be collected from five (5) locations across the site. The planned locations of the surface soil samples are shown on Figure 5. These samples will be collected near areas of vegetative stress, surficial soil discoloration or other surface indications of potential contamination observed during the site reconnaissance survey. An attempt will be made to conduct this survey during the fall or spring to avoid heavy vegetation-related logistic problems. Although there is no documented presence of any cover material at this site, the at-surface soil horizon (i.e., 0 to 12 inches) will be sampled to evaluate the presence of any contamination in the surface soils. Any observations regarding the presence of possible cover material will be noted in a field notebook and discussed in the SASE report.

Three "background" surface soil samples will also be collected from one location inside the study area (SS-6) and two locations outside of the study area (SS-7 and SS-8). An attempt has been made to select background soil sample locations believed to be representative of site background soil conditions. The proposed locations for the background samples will be confirmed with the EPA and RIDEM during a site visit prior to the surface soil sampling activities. Surface soil samples will be analyzed for the full organic target compound list (TCL) and inorganic target analyte list (TAL).

3.5.2 Subsurface Soil Sampling

Soil samples will be collected from four (4) well borings completed at the site. The planned monitoring well locations are shown on Figure 5. The well borings are related to the locations of the three monitoring wells planned for the site. The soil sampling of these borings will aid in characterizing the site subsurface soils and geology.

In general, soil samples will be collected continuously from the well borings to a minimum depth of the ground water table (estimated to be approximately 10 feet below ground surface) or fill, whichever is greater. Beyond the water table, split-spoon samples will be collected at 5-foot intervals or at any identifiable change in strata to bedrock. If signs of possible contamination (e.g., odors, stains, waste) are observed, continuous soil sampling will resume until such signs are no longer evident. At the location of well MW-2, continuous split-spoon sampling will be conducted to the bedrock to aid in characterizing the site geology. All split spoon samples will be screened with an OVA and HNu immediately upon being opened and logged.

During the completion of all of the well borings, a 10-foot Nx core of the bedrock will be collected at each well location. Well borings will be backfilled with a cement/bentonite slurry, as necessary, for the installation of a shallow ground water monitoring well which intercepts the ground water table.

A minimum of two soil samples will be collected from each of the well borings for the full TCL/TAL analysis. The two soil samples which will be submitted for laboratory analysis will include the soil samples collected from the 0 to 2 foot interval and from the base of observed fill material. If signs of potential contamination (e.g., oil, stains, odors) are observed in a boring, a third sample will also be collected from the depth of greatest observed contamination (i.e., most stained or oily, highest OVA/HNu reading). If no fill material or signs of potential contamination are observed in a boring, the surface sample and sample from just above the water table will be submitted for laboratory analysis. A soil sample from the planned screened interval of each well boring will also be collected for total organic carbon analyses and porosity testing.

Geologic descriptions and other sample characteristics (e.g., stains, odors) and observations (e.g., OVA/HNu readings, depth to water) will be recorded in a field notebook.

3.5.3 Test Pit Sampling

Given the lack of documented information on the nature of waste material reportedly disposed of at this site (rubble fill), test pits will be completed to visually characterize the fill materials and to allow for the collection of different fill samples for chemical analysis. Tests pits are currently planned at five (5) different locations on the site. The planned test pit locations are shown on Figure 5. The test pits are planned for areas observed on aerial photographs to have received fill or rubble or areas which were in the vicinity of the 1965 aerial photography pond features.

The findings of the geophysical and soil gas surveys will be reviewed to determine if the planned test pit locations should be moved or if any other test pits should be excavated at the site. The planned test pits would be moved or additional test pits excavated only if the geophysical and/or soil gas surveys indicate the presence of a geophysical or soil gas anomaly outside of an area already planned for investigation with a test pit. Significant findings of the geophysics and soil gas surveys will be reviewed with the EPA and RIDEM to assess the need for any modifications to the test pit program prior to initiation.

The test pits will be excavated with a trackhoe. The test pits will be completed to the depth of the observed water table. Water is anticipated at five to ten feet below ground surface. One to three soil samples will be collected from each of the five test pit areas. If fill or signs of contamination (e.g., odors, staining) are noticed during test pitting operations, three samples will be collected from the area. One sample will be collected from the bottom of the test pit and the other two will be collected from the side walls. If no evidence of contamination is noted, only one sample will be collected from the bottom of the test pit area. If only demolition-like debris material (e.g., concrete, wood, asphalt) is observed in the pit, one sample will be collected of the fill material from the test pit. Test pit soil/fill samples will be analyzed for the full TCL/TAL.

3.6 GROUND WATER SAMPLING

No investigation of ground water quality has been conducted on this site. Four (4) shallow, water table monitoring wells are planned to assess the ground water quality at this site. Ground water monitoring wells will be installed and sampled to assess ground water flow direction and the impacts of the rubble fill area on the site ground water, if any. The planned locations of the monitoring wells are shown on Figure 5. The monitoring wells are located such that there will be one in the anticipated upgradient direction of the site (MW-1), one in the central portion of the site fill area (MW-2), and two in the anticipated downgradient direction (MW-3 and MW-4).

Ground water samples will be collected from each of the monitoring wells. Wells will be developed after installation. Water levels will be measured in the wells after development and just prior to well purging. The procedures for well development, purging, and sampling are provided in the Field Sampling Methodology Plan provided in Appendix B. Ground water samples will be analyzed for the full TCL/TAL and total chloride. The three ground water samples from wells MW-1, MW-2, and MW-4 will also be field filtered and analyzed for dissolved TAL metals as well as the total TAL metals. In addition, the temperature, pH, conductivity, dissolved oxygen, alkalinity, and salinity of each ground water sample will be measured in the field immediately following sample collection. The methods for these tests are referenced in Appendix B and Appendix C of this work plan.

3.7 SURFACE WATER AND SEDIMENT SAMPLING

No previous sampling of surface water or sediment has been conducted at this site. In the western portion of the site is a low-lying wet area into which runoff from the site is likely to flow. Surface water and sediment samples are proposed to assess impacts, if any, of site rubble disposal activities on the low-lying wet area.

Surface water and sediment samples will be collected from the four locations shown on Figure 5. The samples will be collected from one location at the upstream edge of the on-site swale, two on-site locations, and one swale location just downstream of the study area. Sampling will proceed from downstream to upstream (west to east). Both surface water and sediment samples will be analyzed for full TCL/TAL and total chloride. Sediment samples will also be analyzed for total organic carbon and will be subjected to a grain size distribution analysis. In addition, the temperature, pH, conductivity, dissolved oxygen, alkalinity, salinity, and hardness of the surface water will be measured at each sample location.

Graduated wooden stakes will also be driven at each of the surface water sample locations from which surface water levels will be referenced at the time of sampling. The elevation and location of the graduated stakes will be surveyed during site land surveying activities. Both surface water and ground water elevation measurements will be obtained concurrently during the site investigation to assess surface water and ground water interactions.

3.8 LAND SURVEY

Following completion of field sampling activities the site will be surveyed by a State of Rhode Island registered surveyor. The physical features of the study area along with the location and elevation of sampling points will be determined in the survey. A topographical survey will also be conducted at each site. Each sampling location will be referenced to the State of Rhode Island Grid Coordinate System. Completed monitoring wells will be surveyed for elevation at the top of the protective casing, top of the well casing, and adjacent land surface. Elevations will be referenced to mean low water (mlw) and a United States Geological Survey benchmark.

4.0 SITE-SPECIFIC HEALTH AND SAFETY SUMMARY

4.1 INTRODUCTION

The purpose of the site-specific health and safety plan is to summarize the site-specific health and safety information. This section describes the nature of wastes material reportedly present at the site, the site access and work zones, and the initial level of personnel protection and monitoring planned for each site investigation activity. In addition, a list of site emergency contacts and a map of the route to the Newport Hospital from the site is provided as Table 2 and Figures 6 and 6A, respectively.

4.2 NATURE OF WASTES

Available site background information (IAS, 1983) indicates this area was used for disposal of concrete, asphalt, slate, wood, brush, and small quantities of ash from approximately 1978 until 1982. In addition, historic aerial photographs indicate that fill materials appear to have been placed within this area from approximately 1951 to 1981. Waste characteristics typical of rubble/soil fill areas, namely, heterogeneous composition and irregular densities are anticipated. Based on the suspected disposal of ash materials, chemical hazards may include heavy metals. The disposal of organic debris and presence of native organic muck may also result in the presence of natural decomposition products such as methane.

4.3 SITE ACCESS/WORK ZONES

The entire site is surrounded by a chain-link fence. Access to the site can be obtained by gates located to the north (for a storage area) and to the east along Coddington Highway.

During subsurface explorations (soil borings, test pits), the On-site Safety Coordinator (OSC) or designee shall establish a 25-foot exclusion zone around the exploration equipment (drill rig, trackhoe) being used at each of the respective test pit and well locations. The exclusion zone will be demarcated using orange safety cones and caution tape or barricades.

The OSC or alternate will be responsible for keeping nonessential personnel outside of the exclusion zone boundaries during the investigation activities. In the event that authorized visitors are present on the site during field activities, the OSC or designee shall insure that they adhere to site safety requirements and maintain a safe distance outside of the exclusion zone. All personnel allowed to enter the exclusion zone shall be required to follow safety procedures described in the project HASP and directions of the OSC.

A contamination reduction station, or decontamination area, shall be established adjacent to the exclusion zone, as necessary. The contamination reduction zone will be established at the upwind side of the exclusion zone and will consist of an area adequate in size to comfortably contain decontamination equipment. Personnel exiting the exclusion zone shall undergo appropriate decontamination, if necessary, as required by the activity-specific procedures described in the HASP.

The support zone for this site will be the company vehicles used by the field investigation crew. The vehicles will provide temporary relief from any adverse weather conditions and will store necessary field sampling and safety/emergency equipment (e.g., car phone, first aid kit, drinking water, HASP).

Disposal of field-generated materials is described in the Investigation Derived Waste Plan provided in the Project Introduction and Background volume of the Work Plan.

4.4 PERSONNEL PROTECTION AND MONITORING

Based on the suspected disposal of rubble material and the lack of known or suspected hazardous materials at the site, the field investigation activities will be initiated in either Level D or Modified Level D personnel protection (as defined in the HASP). A list of anticipated initial levels of personnel protection for each of the specific investigation activities is presented in Table 3.

During field sampling activities, continuous monitoring of ambient air will be conducted with an OVA and HNu. During drilling and excavation activities, continuous ambient monitoring of combustible gas levels will also be conducted with an LEL/O2 meter. Air monitoring will also be performed "downhole" during drilling and over excavations during test pit operations.

- TABLES -

Study Area 04 - Coddington Cove Rubble Fill Area

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TABLE 1

STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA SITE INVESTIGATION SUMMARY

RECONNAISSANCE SURVEYS:

Walkover, ambient air, and radiological surveys on 50-foot spaced traverses.

GEOPHYSICAL SURVEYS:

Electromagnetic conductivity and magnetometer surveys on a 50-foot spaced traverses.

SOIL GAS SURVEY:

A soil gas survey will be conducted on a 100-foot spaced traverses.

SOIL SAMPLING:

Surface Soil:

Surface soil samples will be collected from five (5) locations, and three background locations. Soil samples will be analyzed for the full TCL/TAL.

Test Pits:

Test pits will be excavated at five (5) locations on-site. One to three samples will be collected per test pit. Test pit soil samples will be analyzed for the full TCL/TAL.

GROUND WATER SAMPLING:

Monitoring Wells:

Monitoring wells will be installed at four (4) locations. One well will be installed in the anticipated upgradient location, one through the fill, and the third and fourth wells in the anticipated downgradient location. Samples will be analyzed for the full TCL/TAL and total chloride. Temperature, pH, conductivity, dissolved oxygen, alkalinity, and salinity of ground water samples will be measured in the field.

SURFACE WATER/SEDIMENT SAMPLING:

Surface water/sediment sample pairs will be collected from one upstream location, two locations adjacent to the fill area, and one location downstream of the fill area. The samples will be analyzed for the full TCL/TAL and total chloride. Sediment samples will also be analyzed for TOC and tested for grain size distribution. Temperature, pH, conductivity, dissolved oxygen, alkalinity, salinity, and hardness of samples will be determined.

LAND SURVEY:

A professional land survey will be conducted of site features and sampling points.

TABLE 2

STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA
SITE EMERGENCY CONTACTS

NETC Emergency Numbers:

Command Duty Officer	*841-3456 or 3457*
Security Office - Police	*841-3241*
NETC Fire Protection	*841-3333*
Public Works Trouble Desk	*841-4001*

Utilities:

Rhode Island Dig Safe	*800-225-4977*
NETC Dig Safe	*841-2464*

Newport Emergency Numbers:

Newport Police Dept.	*847-1306*
Newport Fire Dept.	*846-2211*
Newport Hospital	
General Number	*846-6400*
Emergency Room	*846-6400 ext. 1120*
Poison Control Center	*277-5727*

Additional Resources:

Dr. Erdil, or Dr. Stahl - TRC Company Physicians, Immediate Medical Care, Hartford, Connecticut (203) 296-8330
Mr. James Peronto - TRC Project Manager - (203) 289-8631
Ms. Rachel Marino - NETC Environmental Coord. - (401) 841-3735
Mr. Robert Hanley - NETC Safety Officer - (401) 841-2478

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TABLE 3

STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA
PERSONNEL PROTECTION SUMMARY

Activity	*Initial Level of Protection*
Geophysical Survey	*D*
Soil Gas Survey	*D*
Test Pit Operations	*D*
Ground Water Sampling	*Mod. D*
Surface Water/Sediment	*Mod. D*

NOTE: *The personnel protection levels will be upgraded or downgraded as conditions warrant according to criteria specified in the project Health and Safety Plan (HASP).*

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TABLE 4

Study Area 04 - Coddington Cove Rubble Fill Area
Surface Soil Sample Location Rationale

SAMPLE NUMBER	LOCATION / RATIONALE
SS-1	Determine the presence of surface soil contamination in the eastern portion of site.
SS-2	Determine the presence of surface soil contamination in the central portion of the site.
SS-3	Determine the presence of surface soil contamination in the central portion of the site.
SS-4	Determine the presence of surface soil contamination in the central portion of the site.
SS-5	Determine the presence of surface soil contamination in the central portion of the site.
SS-6	Determine the site background surface soil quality.
SS-7	Determine the site background surface soil quality.
SS-8	Determine the site background surface soil quality.

TABLE 5

Study Area 04 - Coddington Cove Rubble Fill Area
Test Pit Location Rationale

TEST PIT NUMBER	LOCATION / RATIONALE
TP-1	Investigate fill characteristics and subsurface soil quality in the eastern central portion of the site at what appeared to be the edge of the fill area as shown on historical aerial site photos.
TP-2	Investigate fill characteristics and subsurface soil quality in the central portion of the site at possible fill location observed on historical aerial site photos.
TP-3	Investigate fill characteristics and subsurface soil quality in the central portion of the site where dark circular areas were observed on historical aerial site photos.
TP-4	Investigate fill characteristics and subsurface soil quality in the western central portion of the site at what appeared to be the edge of the fill area as shown on historical aerial site photos.
TP-5	Investigate the presence of fill and the subsurface soil quality in the western portion of the site where no suspected fill activities were observed on historical aerial site photos.

TABLE 6

Study Area 04 - Coddington Cove Rubble Fill Area
Monitoring Well Location Rationale

WELL NUMBER	LOCATION / RATIONALE
MW-1	Investigate the ground water quality at the upgradient edge of the site.
MW-2	Investigate ground water quality in the central portion of the site.
MW-3	Investigate ground water quality in the eastern central to downgradient portion of the site.
MW-4	Investigate ground water quality at the central downgradient edge of the site.

TABLE 7

Study Area 04 - Coddington Cove Rubble Fill Area
Surface Water/Sediment Sample Location Rationale

LOCATION NUMBER	LOCATION / RATIONALE
SW-1/SD-1	Determine the surface water and sediment quality at the most upstream location of the on-site swale; to aid in establishing swale background quality information.
SW-2/SD-2	Determine the surface water and sediment quality in the upstream portion of the site near suspected fill areas.
SW-3/SD-3	Determine the surface water and sediment quality in a low-lying wet area north and downstream of the suspected central fill area of the site.
SW-4/SD-4	Determine the surface water and sediment quality at the downstream location of the swale as it flows off of the site.

- FIGURES -

Study Area 04 - Coddington Cove Rubble Fill Area

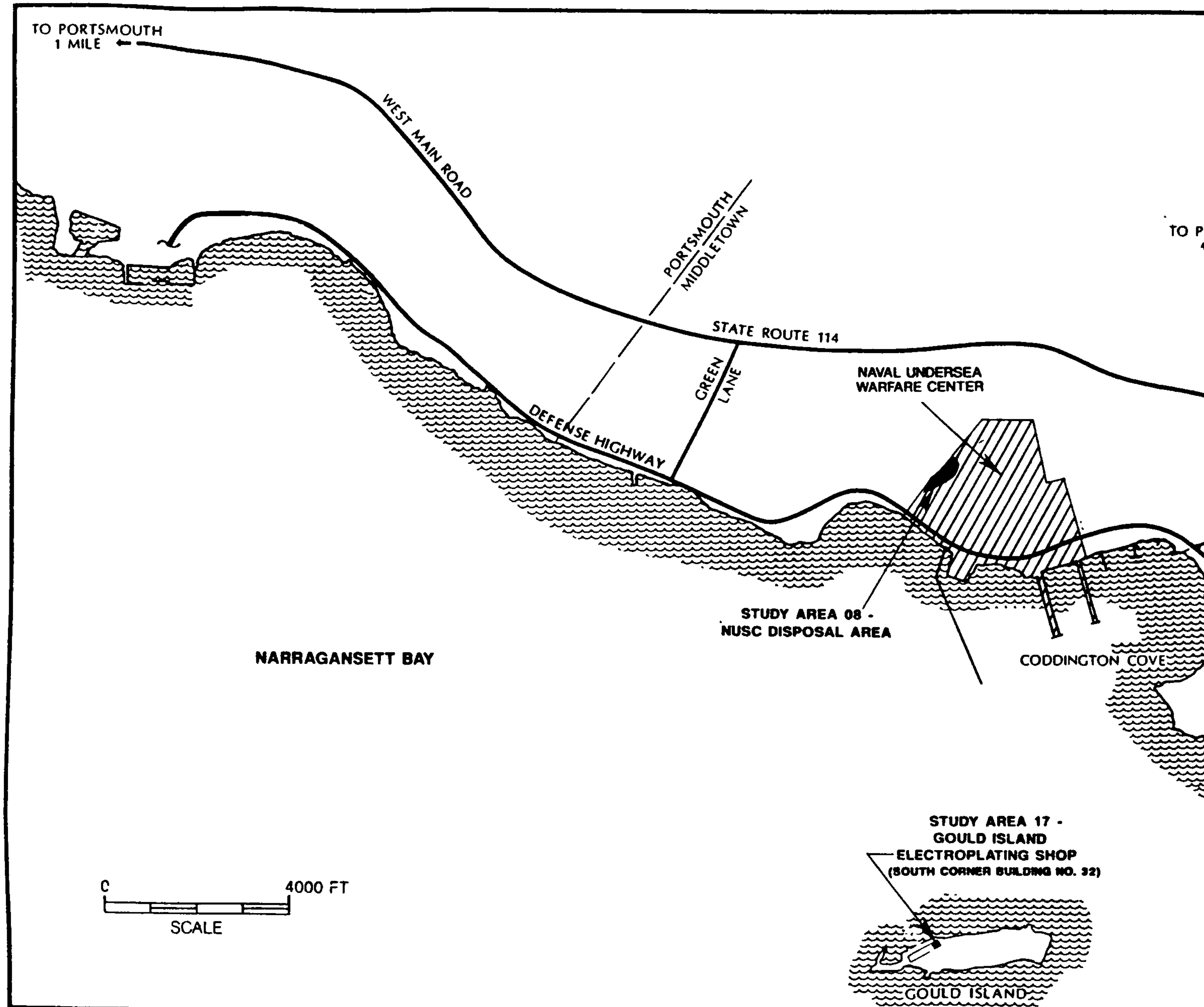

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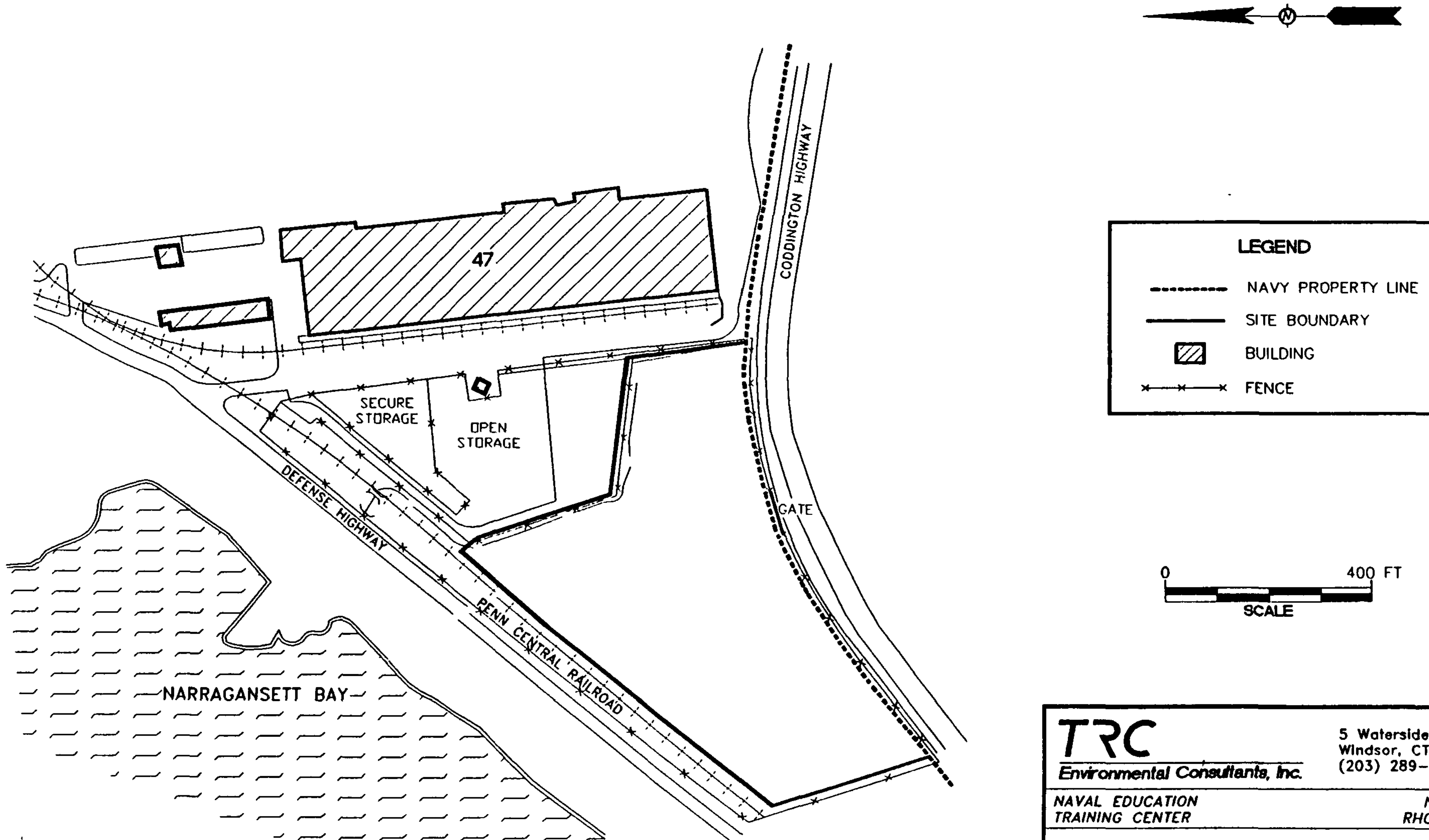
FIGURE 1.

STUDY AREA LOCUS PLAN

Date 12/92 | Drawing No 6760-N81



NOTE BASE MAP DEVELOPED FROM CODDINGTON COVE EXISTING CONDITIONS MAP, NETC DWG NO 28056-278, REV. 10/1/91

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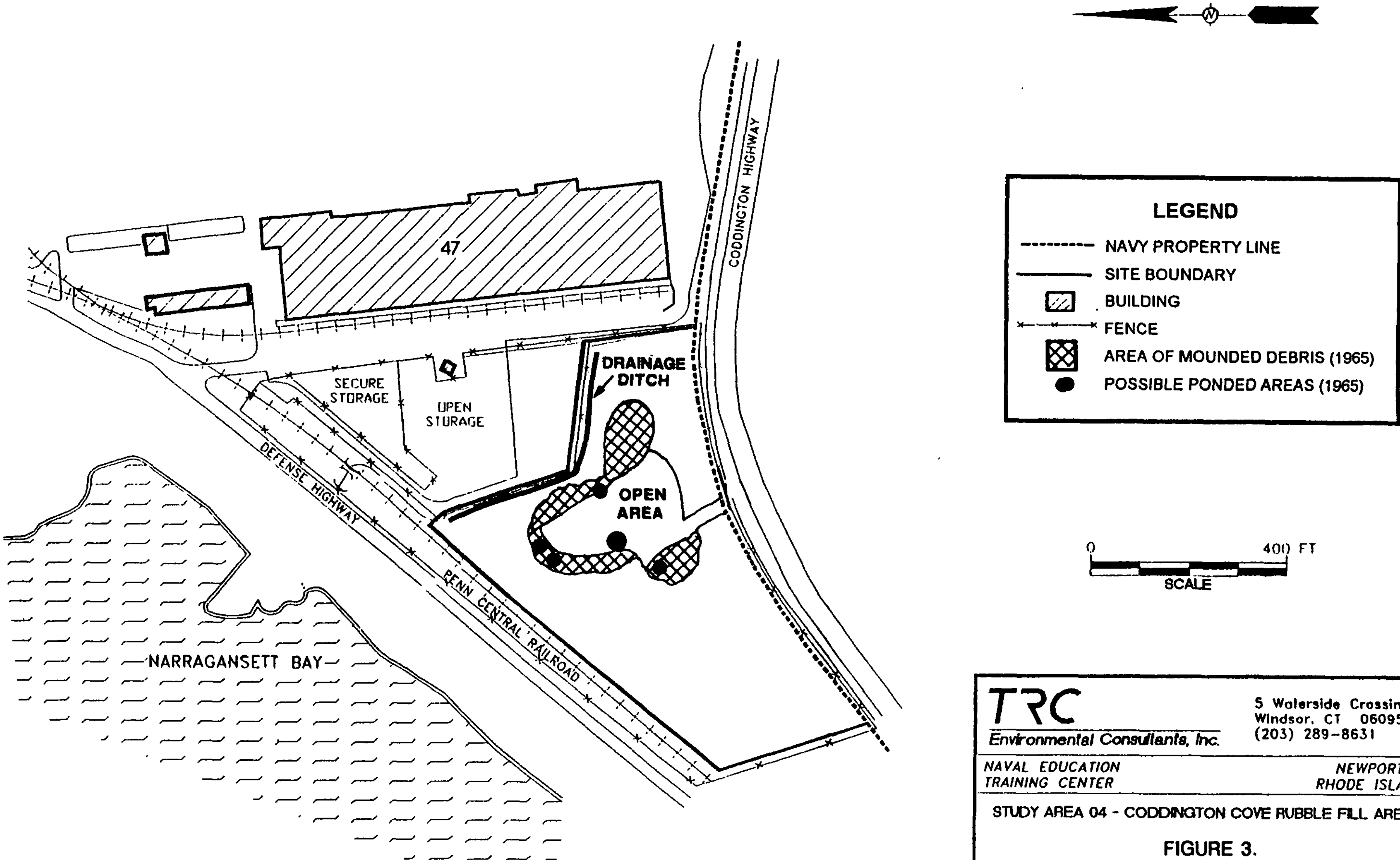
STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA

FIGURE 2.

SITE MAP

Date: 4/92	Project No. 6760-N81



NOTE: BASE MAP DEVELOPED FROM CODDINGTON COVE EXISTING CONDITIONS MAP, NETC DWG NO 28056-278, REV 10/1/91

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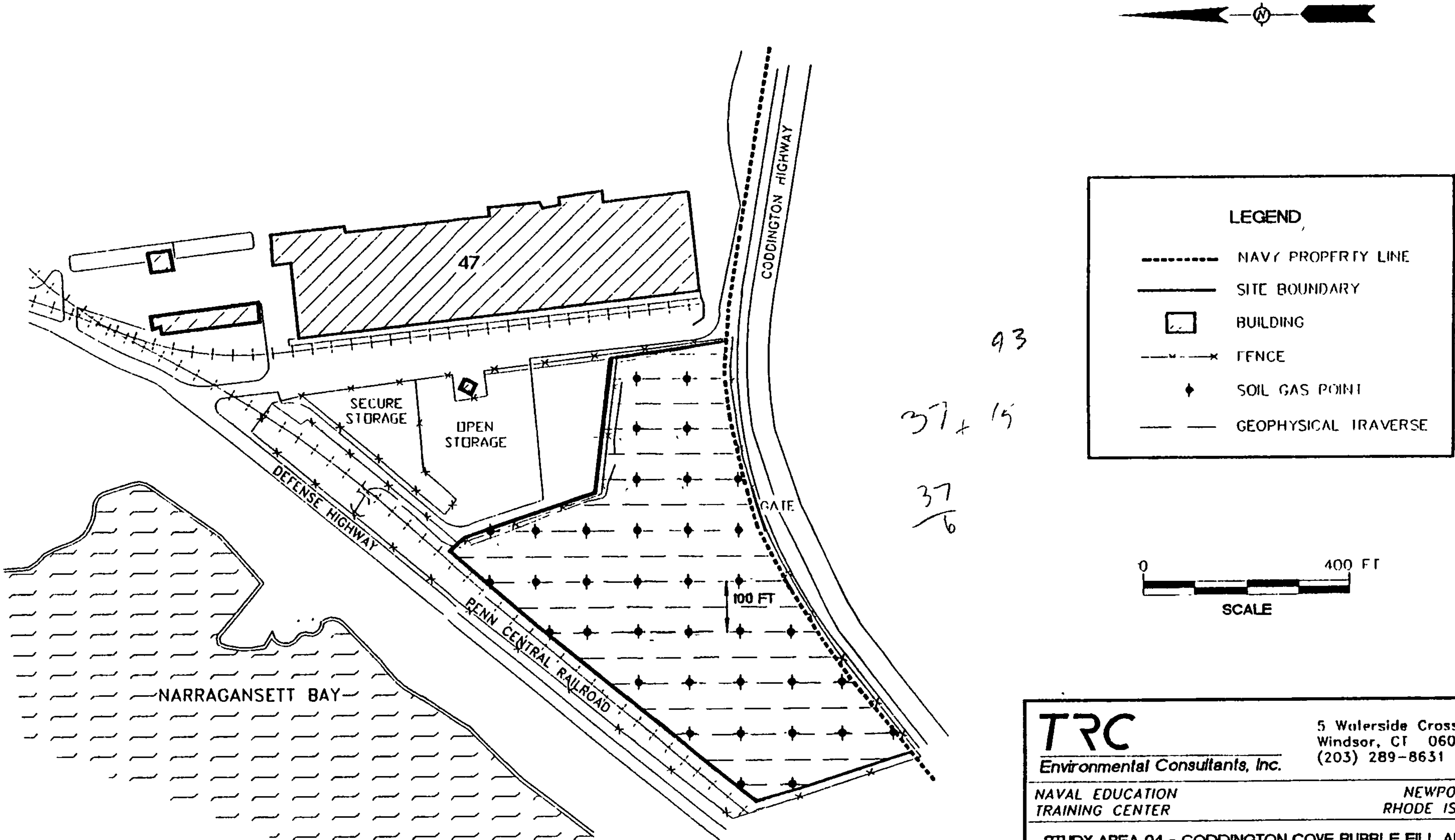
STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA

FIGURE 3.

SITE AERIAL PHOTOGRAPHY OBSERVATIONS

Date: 12/92 | Project No. 6760-N81



NOTE BASE MAP DEVELOPED FROM CODDINGTON COVE EXISTING CONDITIONS MAP, NETC DWG NO 28056-278, REV 10/1/91.

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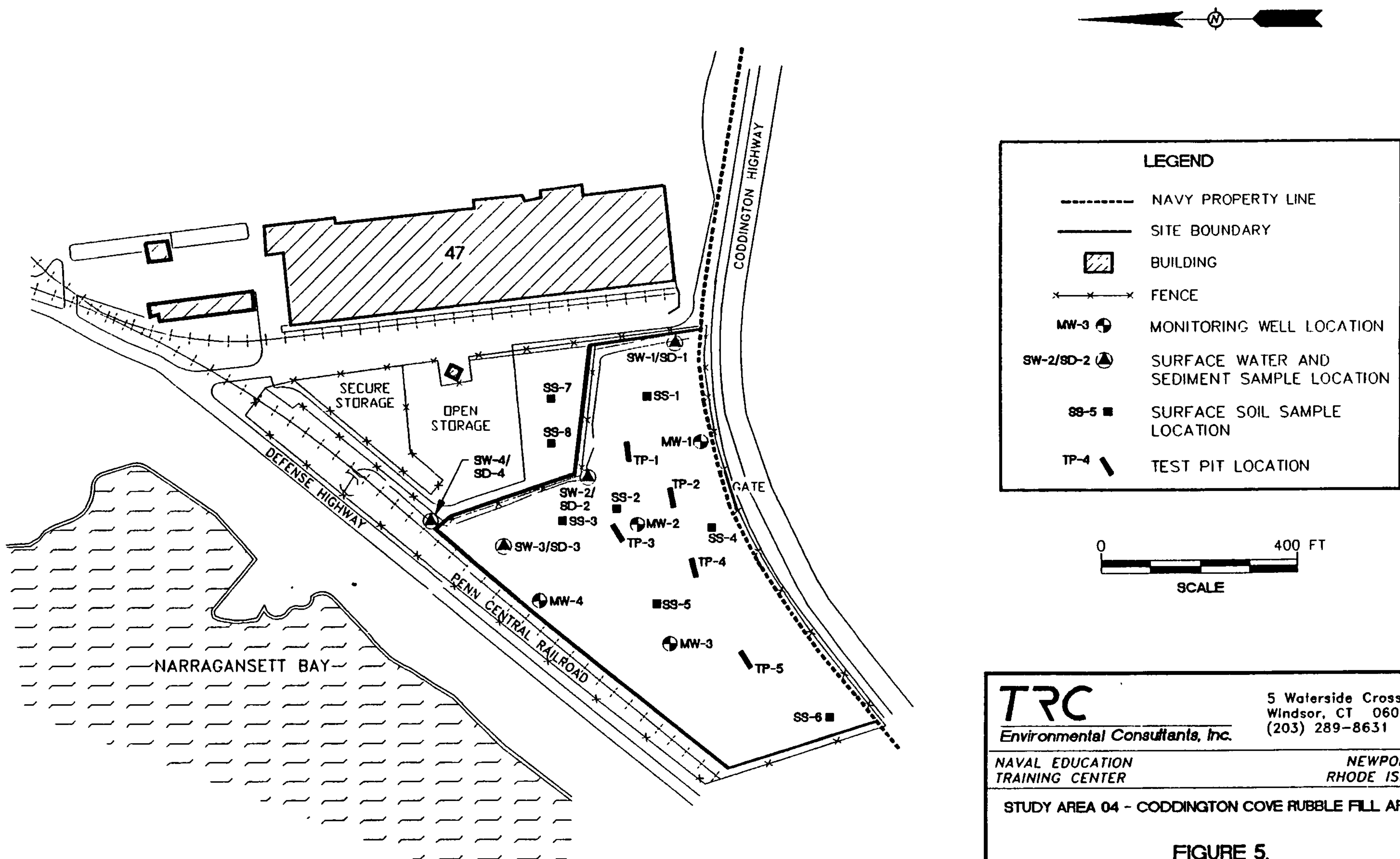
STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA

FIGURE 4.

SITE SURVEY LOCATION MAP

Date: 12/92	Project No. 6760-N81



NOTE. BASE MAP DEVELOPED FROM
CODDINGTON COVE EXISTING CONDITIONS MAP,
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STUDY AREA 04 - CODDINGTON COVE RUBBLE FILL AREA

FIGURE 5.

SITE INVESTIGATION SUMMARY MAP

Date: 4/92	Project No. 6760-N81

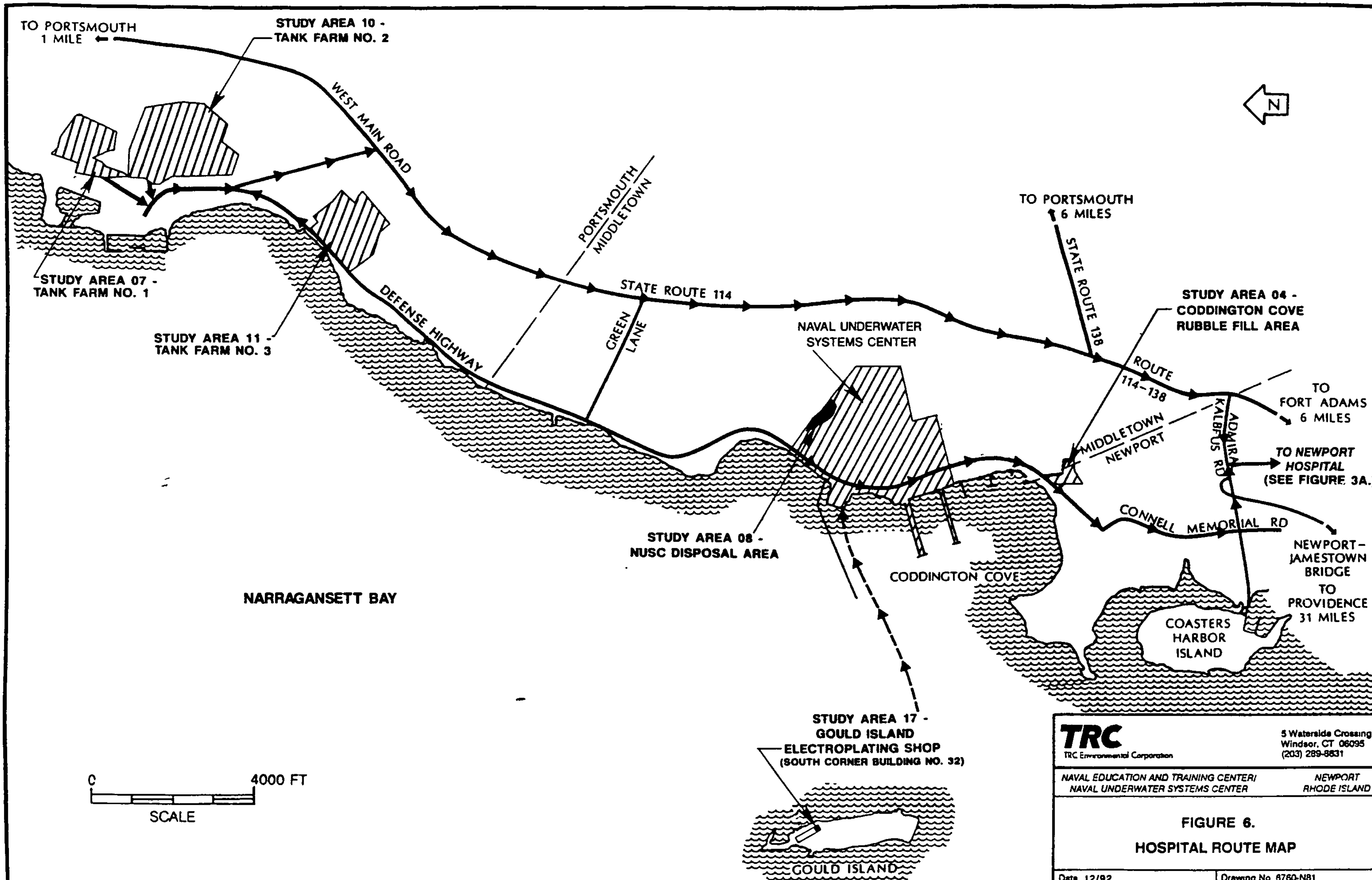

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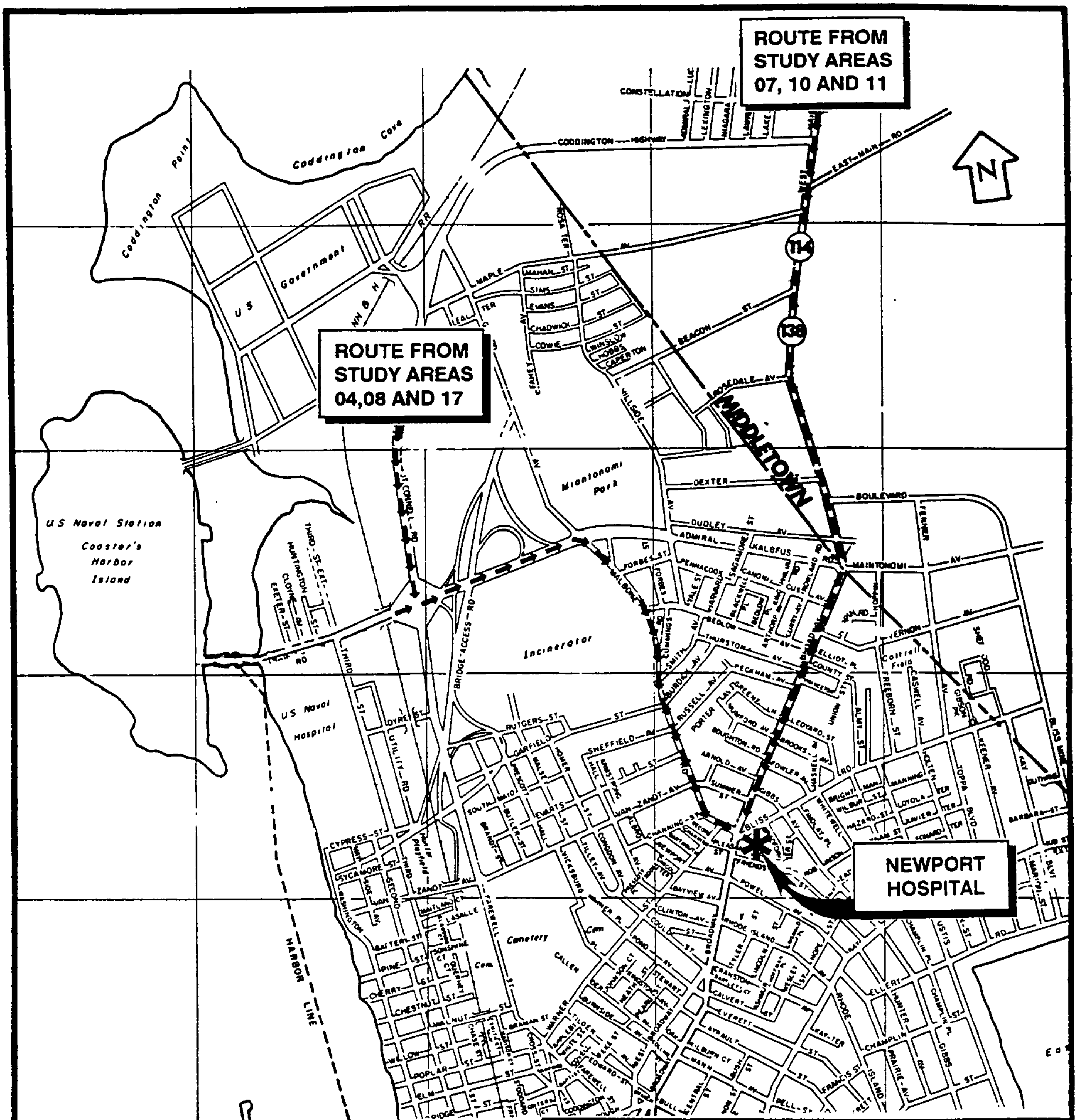
FIGURE 6.

HOSPITAL ROUTE MAP

Date 12/92 | Drawing No 6760-N81



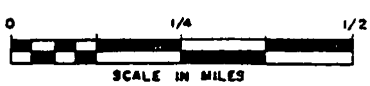


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FIGURE 6a.

NEWPORT HOSPITAL ROUTE MAP

Date: 8/92	Drawing No.. 6760-N81

APPENDIX A
EXISTING CONDITIONS MAP

Study Area 04 - Coddington Cove Rubble Fill Area

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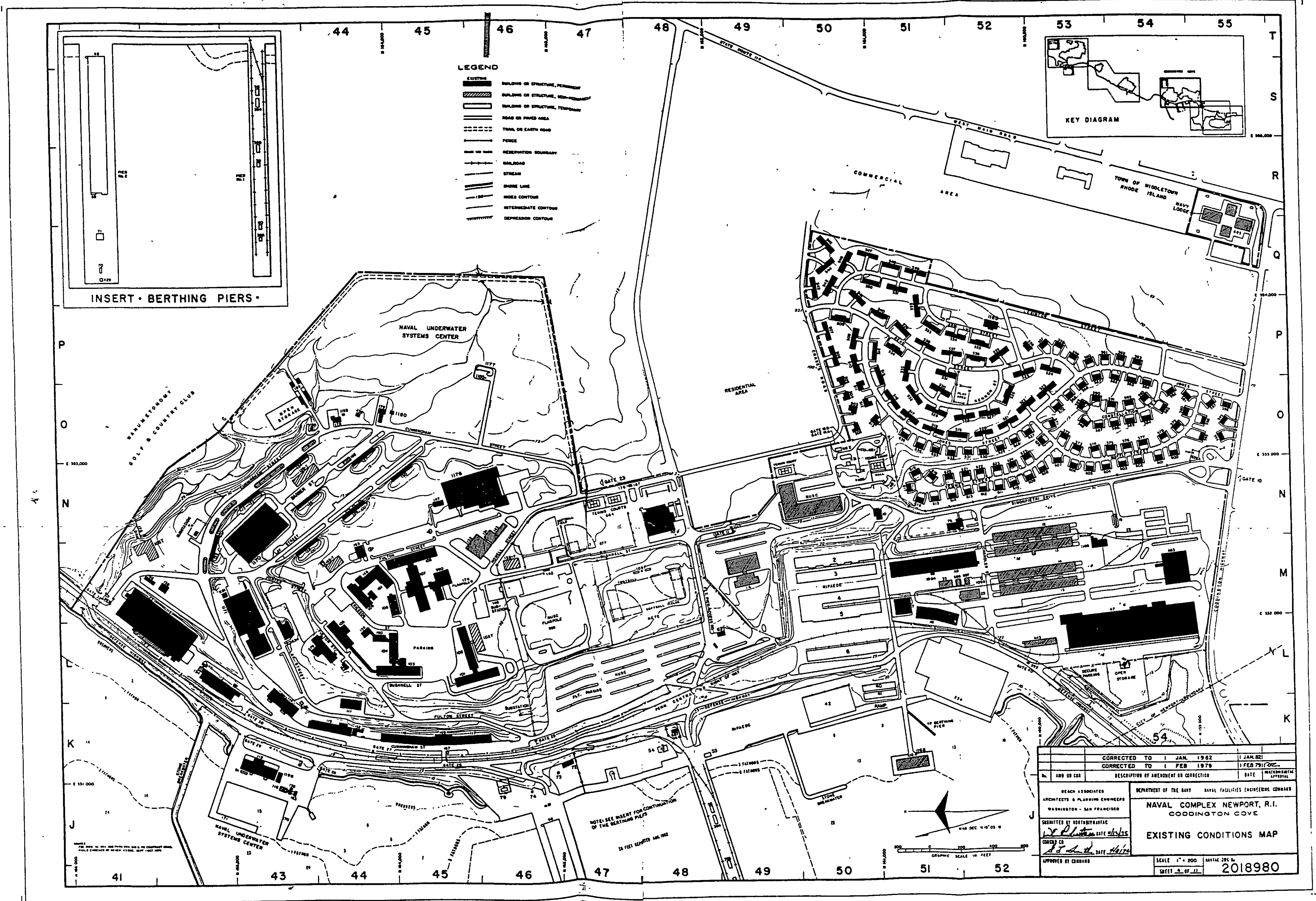

INSERT • BERTHING PIERS •
LEGEND
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WANUMETONOMY GOLF & COUNTRY CLUB
RESIDENTIAL AREA
COMMERCIAL AREA
TOWN OF MIDDLETOWN RHODE ISLAND
NAVY LODGE
KEY DIAGRAM
STATE ROUTE 114
WEST MAIN ROAD
CUNNINGHAM STREET
FULTON STREET
BUSHNELL ST
PARKING
TENNIS COURTS
GATE 23
GATE 10
GATE 20
OPEN STORAGE
SECURE PARKING
NAVAL UNDERWATER SYSTEMS CENTER
NOTE: SEE INSERT FOR CONTINUATION OF THE BERTHING PIERS
GRAPHIC SCALE IN FEET
CORRECTED TO 1 JAN. 1982 | 1 JAN. 82
CORRECTED TO 1 FEB 1979 | 1 FEB 79
No. | AMD OR COR | DESCRIPTION OF AMENDMENT OR CORRECTION | DATE | APPROVAL
BEACH ASSOCIATES
ARCHITECTS & PLANNING ENGINEERS
WASHINGTON - SAN FRANCISCO
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
NAVAL COMPLEX NEWPORT, R.I.
CODDINGTON COVE
EXISTING CONDITIONS MAP
SUBMITTED BY
CONCUR CO
APPROVED BY COMMAND
SCALE 1" = 200
SHEET 4 OF 11
NAVFAC DRG No.
2018980

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

VOLUME II
-NUSC DISPOSAL AREA-
STUDY AREA 08

STUDY AREA SCREENING EVALUATION WORK PLAN
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

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TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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TABLE OF CONTENTS

Page

VOLUME II - NUSC DISPOSAL AREA

TABLE OF CONTENTS Cont'd

VOLUME II - NUSC DISPOSAL AREA

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The objective of this volume of the Work Plan is to define the level of investigation necessary to assess the presence and nature of environmental contamination at Study Area 08, the NUSC Disposal Area located on the Naval Undersea Warfare Center (NUWC) (formerly the Naval Underwater Systems Center or NUSC). Although the name of this Navy facility has changed from NUSC to NUWC, the former historical name of this site, the NUSC Disposal Area, will remain the same and is referenced as such hereafter. This volume of the Work Plan describes site-specific investigation objectives in Section 1.1, summarizes available site background information in Section 2.0, presents the site-specific field sampling plan in Section 3.0, and summarizes site-specific health and safety information in Section 4.0.

1.1 SITE-SPECIFIC INVESTIGATION OBJECTIVES

Currently available information suggests that the NUSC Disposal Area does not pose a threat to human health or the environment. The Initial Assessment Study (IAS) performed on the site in 1983 concluded that no further action was required at the site.

Project objectives for this site are to verify the types of materials reportedly disposed of at the site and assess if contamination is present as a result of such disposal activities. The investigation will assess the presence of releases of hazardous substances to soil and ground water and adjacent surface water and sediments through a focused program of investigation. This program will include a reconnaissance survey, geophysics, a soil gas survey, surface and subsurface soil sampling, monitoring well installation and sampling, surface water and sediment sampling, and piezometer installation, as described in Section 3.0 of this plan.

Given the limited amount of available site background information, a relatively thorough investigation is proposed to document the suspected absence of environmental contamination and potential threats to human health and the environment. If the planned site investigation findings support this hypothesis, no further investigation or monitoring would be proposed at this site. However, if the findings of the site investigations indicate the presence of site-related environmental contamination, additional investigation activities and/or limited response actions (e.g., removals) may be conducted at the site.

2.0 SITE BACKGROUND INFORMATION

2.1 SITE LOCATION

The NUSC Disposal Area (Study Area 08) is located on the northwestern edge of the Naval Undersea Warfare Center (NUWC), formerly called the Naval Underwater Systems Center (NUSC). As described in the Initial Assessment Study, the site is referred to as the NUSC Disposal Area hereinafter. The NUSC Disposal Area occupies approximately one acre or less north of Building 1170 and Cunningham Street on NUWC. The location of the NUSC Disposal Area, relative to other study areas within the Newport Naval Base, is shown on Figure 1. A U.S. Navy existing conditions map is provided in Appendix A.

As shown on Figure 2, just north of the site is the Wanumetonomy Golf & Country Club. West of the site is a pond and low lying wet area, beyond which is the Defense Highway and Narragansett Bay. South of the site is an unnamed stream which flows into an unnamed pond, followed by Cunningham Street and NUWC. East of the site is a portion of NUWC used as an open storage area for large equipment. Two asphalt pads are used in this area for the temporary storage of large equipment such as buoys, vans, empty torpedo shells, cable reels and other equipment. A series of four open sided, covered sheds, with two foot concrete berms are present in this area. These sheds, labelled as Building No. 185 are used for the storage of drummed oils and torpedo propellants.

2.2 SITE DESCRIPTION

A map of the site is provided on Figure 3. The site can be physically characterized as an elevated stream embankment area which borders an unnamed stream to the southwest. A small stream also cuts through the northern portion of the site in an east-west direction. The stream originates from the golf course north-northeast of the site. This small stream joins with the primary stream west of the site and flows into an unnamed pond northwest of the site.
Just northwest of the small stream which cuts through the site is a flat, open, small, plateau-like area. Southeast of the small stream is another elevated flat area which is used by NUWC for the storage of large equipment such as steel buoys and other miscellaneous equipment.

Site topography is highly variable, with topographic relief of approximately 15 to 20 feet from the northern to the southern portions of the site. A low elevation is reached in the stream valley on the northwestern edge of the site.

Vegetation on the site consists of grassy and lightly wooded areas. The plateau-like area described above is open and grassy. Just south and southeast of this area is a stream and a lightly wooded area. Along the stream is a low-lying wet area with vegetation typical of a stream environment.

2.2.1 Site Observations

On March 25, 1992 TRC-ECI visited the subject study area. Mr. Guy Borgess of NUWC provided a tour of the subject area. Significant observations during the site visit included the following:

- A small stream was flowing from the bordering golf course into the low lying area southeast of the pond. A small stream flows from this low lying area into the pond.
- Heavy vegetative cover, including brush, obscured the embankment surface from the upper open grassy area to the stream at the bottom of the hill.
- A mounded area and miscellaneous debris including concrete and wood was observed along the embankment southeast of the small stream which cuts through the site. (Note: This fill area is consistent with the information obtained from aerial photographs described below, and likely represents the NUSC Disposal Area).

2.3 PREVIOUS SITE INVESTIGATIONS AND HISTORY

The Initial Assessment Study (IAS, Envirodyne Engineers, 1983) identified areas where potential contamination from past waste disposal or handling practices may pose human health or environmental risks. The NUSC Disposal Area was reviewed under the IAS. The disposal area investigated under the IAS is shown on Figure 4, as obtained from the IAS report. The IAS recommended no further action at the NUSC Disposal Area.

Relatively little information was provided on the NUSC Disposal Area in the IAS. However, the report did indicate this area was used for disposal of scrap lumber, tires, wire, cable, and empty paint cans for an unspecified period of time.

2.3.1 Aerial Photography

Aerial photographs of the site dating from 1942, 1951, 1963, 1965, 1970, 1975, 1981, and 1988 were reviewed at the Rhode Island Department of Administration, Division of Planning. Below is a summary of site observations obtained from the review of the aerial photographs.

The 1942 aerial photo indicated no evidence of activity in the vicinity of the reported NUSC Disposal Area. The pond located northwest of the site is present. The small plateau-like area is evident on this photograph as an open grassy area.

The 1951 photo coverage indicated that the perimeter of the pond area adjacent to the site was consistent with 1942 coverage; however, the pond appears nearly dry, with water visible only at its northwestern end. An area of light colored soil, which appears indicative of filling, is visible just southeast of the IAS reported NUSC Disposal Area. This area is located just southeast of the open storage area shown on Figure 3 near Buildings 185. The 1963 coverage is consistent with 1951 coverage, although the area of light colored soils, or possible filling, is somewhat larger.

The 1965 through 1981 aerial coverage indicated no apparent disturbance of the NUSC Disposal Area as identified in the IAS report on Figure 4. However, the aerial photos did indicate the presence of mounded soils, possibly indicative of fill material, southeast of the IAS identified NUSC Disposal Area.

The first evidence of the NUSC Disposal Area shown on Figure 4 (adapted from Figure 6.6.8 of the IAS report) is on the 1988 aerial photography. The 1988 photography shows a crescent shaped area of light colored material, possibly fill, at the NUSC Disposal Area identified on Figure 6.6.8 of the IAS report.

In summary, fill materials were observed southeast of the unnamed stream which cuts through the site from 1951 through 1988. The 1988 aerial photography indicates a crescent shaped area of light colored material at the IAS identified NUSC Disposal Area. Therefore, aerial photographs indicate that the IAS identified disposal area, may, in fact, lie further southeast than described in the IAS report.

2.4 SITE HYDROGEOLOGY AND GEOLOGY

No site-specific hydrogeologic information is available on the NUSC Disposal Area. However, based upon the site topography and the nearby stream flow, site ground water flow is anticipated to be to the west or northwest towards Narragansett Bay. However, no subsurface explorations or ground water measurements have been conducted to confirm this flow direction. In addition, localized ground water flow directions on the site may vary as a result of the on-site and nearby surface water features.

Subsurface materials on the site are anticipated to consist of fill and a mixture of sands, silts, till, and weathered shale. In addition, given the presence of the stream and low lying wet areas adjacent to the stream and pond, some organic soils and mucks are anticipated.

The NUSC Disposal Area is located within a Rhode Island DEM Class GB ground water setting. Immediately north of the site, at the Wanumetonomy Golf & Country Club, the ground water is unclassified and is, therefore, presumed by the DEM to be Class GA quality. The Paradise Motel Park well is the closest public ground water supply well. This well is located approximately 1.5 miles south-southeast of the study area in an anticipated up or side gradient location. The closest public reservoir is Sisson Pond located approximately 1.7 miles northeast of the site in an anticipated upgradient location. The location of the Paradise Park well and Sisson Pond reservoir are shown on Figure 6 of the Project Introduction and Background volume of this Work Plan.

2.5 SITE WASTE CHARACTERISTICS

Available site background information (IAS, 1983) indicates that this site was used for disposal of the following:

- Scrap Lumber,
- Tires,
- Wire,
- Cable, and
- Empty Paint Cans

The IAS report describes several NUWC operations which had the potential to generate hazardous materials. These operations included industrial plating, anodizing and chemical cleaning within Building 1170 (located approximately 200 feet southwest of the site), and PCB storage at an unnamed location. Available information does not indicate disposal of these materials at the NUSC Disposal Area.

Chemical hazards could include VOCs and heavy metals from paint residues, as well as methane produced from the natural decomposition of organic materials.

3.0 SAMPLING PLAN

3.1 INTRODUCTION

The program of investigation described in this section has been developed to achieve both overall project and site-specific objectives. Field sampling methodology for individual investigatory activities (soil gas survey, surface soil sampling) is described in Appendix B. The quality assurance/quality control procedures for field sampling and laboratory analyses are presented in the project Quality Assurance/Quality Control (QA/QC) Plan provided as Appendix D. A summary of the NUSC Disposal Area investigation program is presented in Table 1. The planned site survey and sample locations are shown on Figures 5 and 6, respectively. The rationale for each of the sample locations are presented in Tables 4 through 7.

3.2 RECONNAISSANCE SURVEYS

Prior to initiating sampling activities, a site walkover will be conducted by the TRC sampling team members to familiarize themselves with site conditions. The site will be reviewed with respect to access restrictions, sampling locations, and establishment of appropriate survey grids. Site-specific health and safety considerations, including emergency evacuation procedures, will be reviewed. Pertinent features, such as any overhead and subsurface utilities, and other potential hazards will be reviewed with Navy personnel with respect to planned sampling activities.

Following completion of the walkover survey, an air and radiological survey will be conducted at the site. This survey will be conducted on an approximately 50-foot square grid pattern as indicated on Figure 5. The ambient air survey will be conducted with either a flame or photo-ionization detector to assess ambient conditions for the presence of volatile organic compounds (VOCs). The radiological survey will be conducted with an alpha/beta meter and gamma meter (a sodium iodide scintillation meter) to assess the absence or presence of any radiologic hazards on the site. The ambient air and radiological surveys will be completed using equipment and methods outlined in Appendix B.

If radiation readings above measured general area background values are observed during the surveys, the location(s) of elevated radiation readings will cordoned off for further assessment by a certified health physicist.

3.3 GEOPHYSICAL SURVEYS

Electromagnetic (EM-31) and magnetometer surveys are proposed at this study area. These surveys will be used to aid in evaluating the nature and extent of fill at the site. These surveys will be conducted on an approximately 50-foot spaced grid pattern shown on Figure 5. In addition to recording EM readings at grid points, continuous EM readings will also be observed between grid points. Any EM readings which are observed to significantly deviate between points (e.g., highs, lows, negatives) will also be recorded.

3.4 SOIL GAS SURVEY

A soil gas survey is proposed at this study area to aid in assessing the presence of subsurface volatile organic compound (VOC) contamination. The soil gas survey will be conducted on a 100-foot grid shown on Figure 5. As becomes necessary, additional soil gas survey points will be completed around any points indicating elevated concentrations of VOCs. As described in the Field Sampling Methodology discussion provided in Appendix B, soil gas samples will be analyzed with an organic vapor analyzer for total VOCs and a HNu-311 portable gas chromatograph (GC) or equivalent. The portable GC will be used to identify the individual concentrations of several aromatic and chlorinated volatile organic compounds.

3.5 SOIL SAMPLING

Soil samples will be collected as surface soil samples and test boring samples under this investigation. Below is a discussion of the each of the planned soil sampling activities. Given the steep site topography, and the proximity of the site to flowing streams, test pits are not planned to investigate the fill characteristics at the site.

3.5.1 Surface Soil Sampling

Surface soil samples will be collected from five (5) locations on the site. The approximate locations planned for these samples are shown on Figure 6. The rationale for the surface soil sample locations is presented in Table 4. Attempts will be made to collect these samples from any areas of fill, vegetative stress, surficial soil discoloration, or other possible indications of surficial contamination observed during the site reconnaissance survey. In addition, two "background" surface soil samples will be collected from the locations outside of the anticipated influence of the site. An attempt has been made to select background soil sample locations believed to be representative of true background conditions. The proposed locations for the background samples will be confirmed with EPA and RIDEM during a site visit prior to the surface soil sampling activities. Surface soil samples will be analyzed for the full organic target compound target compound list (TCL) and inorganic target analyte list (TAL).

3.5.2 Subsurface Soil Sampling

Soil samples will be collected from five (5) test borings and four (4) well borings completed at the site. The planned test boring and monitoring well locations are shown on Figure 6. Test borings are planned to investigate the characteristics of the fill on the site. The well boring locations coincide with the locations of the four monitoring wells planned for the site. The rationale for the test boring locations is presented in Table 5.

Four (4) test borings are planned in the southern end of the site to investigate filling activities observed in this area on historic aerial photos. Another test boring is planned for the northern end of the site to confirm that the open, flat, plateau-like area is a naturally occurring feature (as appeared to be the case from historic aerial photos) and not due to filling activities. The well boring completed in the northern portion of the site will also provide information on the fill in that area.

The planned test boring locations may be reassessed based upon any significant findings of the site geophysical and soil gas surveys. If these preliminary surveys indicate the likely locations of buried contaminated materials or different fill types, test borings will be relocated to investigate any such locations. Any significant findings of the surveys (e.g., anomalies, detected VOCs) will be reviewed with EPA and RIDEM prior to moving any of the planned test boring locations to further investigate such findings.

Soil samples will be collected continuously from the on-site soil borings to a minimum depth of the ground water table (estimated to be approximately 20 feet below ground surface) or fill, whichever is greater. Beyond the water table, split-spoon samples will be collected at 5-foot intervals or at any identifiable change in strata for another 10 feet or to bedrock, whichever is first. If signs of possible contamination (e.g., odors, stains, waste) are observed, continuous soil sampling will resume until such signs are no longer evident. All split spoon samples will be screened with an OVA and HNu immediately upon being opened and logged.

Split-spoon sampling of well borings will continue to the depth of bedrock. At the location of well MW-3, continuous split-spoon sampling will be conducted to the bedrock to aid in characterizing the site geology. A 10-foot Nx core of the bedrock will be collected at each well boring location. Well borings will be backfilled with a cement/bentonite slurry, as necessary, for the installation of a shallow ground water monitoring well which intercepts the ground water table.

A minimum of two soil samples will be collected from each of the on-site borings for the full TCL/TAL analysis. The two soil samples which will be submitted for laboratory analysis will include the soil samples collected from the 0 to 2 foot interval and from the base of observed fill material. If signs of potential contamination (e.g., oil, stains, odors) are observed in a boring, a third sample will also be collected from the depth of greatest observed contamination (i.e., most stained or oily, highest OVA/HNu reading). If no fill material or signs of potential contamination are observed in a boring, the surface sample and sample from directly above the water table will be submitted for laboratory analysis. At the two off-site well boring locations (MW-1 and MW-4) only the 0 to 2 foot soil samples are planned for laboratory analysis; however, if signs of potential contamination are observed in one of these borings, additional soil samples may be collected for analysis. A soil sample from the planned screened interval of each well boring will also be collected for total organic carbon analyses and porosity testing.

Geologic descriptions and other sample characteristics (e.g., stains, odors) and observations (e.g., OVA/HNu readings, depth to water) will be recorded in a field notebook.

3.6 GROUND WATER SAMPLING

No previous investigation of ground water quality has been conducted on this site. Four (4) shallow, water table monitoring wells are planned to assess the ground water quality at this site. Ground water monitoring wells will be installed and sampled to assess the site ground water flow direction and the impacts of the historic fill activities on the site ground water, if any.

The planned monitoring well locations are shown on Figure 6. The rationale for the monitoring well locations is presented in Table 6. The monitoring wells are planned in the following locations: one in the anticipated upgradient direction of the site to the east (MW-1), one in the central portion of the site (MW-2), one in the northern portion of the site (MW-3), and in the anticipated downgradient direction of the site to the northwest (MW-4).

In addition to the installation of monitoring wells for ground water elevation measurements, piezometers (eight) also will be installed adjacent to the stream and pond at the locations of the surface water/sediment sampling locations. The piezometer and surface water levels measurements will indicate whether the streams and pond are "gaining" or "losing" surface water bodies. Water levels will be measured from the piezometers and surface water stations at times concurrent with the ground water elevation measurements.

Ground water samples will be collected from each of the monitoring wells. Wells will be developed after being installed. Water levels will be measured in the wells after development and just prior to well purging. The procedures for well development, purging, and sampling of the wells are provided in Appendix B of this Work Plan. Ground water samples will be analyzed for full TCL/TAL and total chloride. In addition, the temperature, pH, conductivity, dissolved oxygen, alkalinity, and salinity of each ground water sample will be determined. The methods for these tests are referenced in Appendix B and Appendix C of this work plan.

3.7 SURFACE WATER AND SEDIMENT SAMPLING

No previous sampling of surface water or sediment has been conducted at this site. A small stream cuts through the site, another stream runs along the southern edge of the site, and a pond into which each stream flows, is located just west of the site. Surface water and sediment samples are planned to assess impacts of environmental contamination, if any, of the site filling activities on the streams and pond.

Surface water and sediment samples will be collected from the eight (8) locations shown on Figure 6. The rationale for the surface water and sediment sample locations is presented in Table 7. The samples will be collected from the following locations: one in the southern primary stream just upstream of the site (SW-1/SD-1), one in the southern primary stream just west of the site (SW-2/SD-2), one in the southern primary stream just downstream of the site (SW-3/SD-3), one in the small stream just upstream of the site and downstream of the golf course (SW-4/SD-4), one in the small stream just downstream of the site (SW-5/SD-5), one just downstream of the confluence of the two streams (SW-6/SD-6), one in the pond at the mouth of the stream (SW-7/SD-7), and one at the northern end of the pond (SW-8/SD-8).

The surface water and sediment samples will be analyzed for the full TCL/TAL. Surface water samples will also be submitted for total chloride analysis. Sediment samples will also be analyzed for total organic carbon and subjected to a grain size distribution analysis. In addition, the temperature, pH, conductivity, dissolved oxygen, alkalinity, salinity, and hardness of the surface water at each sample location will also be measured in the field. Graduated wooden stakes will also be driven at each of the surface water sample locations from which surface water levels will be referenced at the time of sampling. The elevation and location of the graduated stakes will be surveyed during site land surveying activities. Both surface water and ground water elevation measurements will be obtained concurrently during the site investigation to assess surface water and ground water interactions.

3.8 LAND SURVEY

Following completion of field sampling activities the site and nearby surrounding area will be surveyed by a State of Rhode Island registered surveyor. The physical features of the area along with the location and elevation of sampling points will be determined in the survey.

A topographical survey will also be conducted of the site. Each sampling location will be referenced to the State of Rhode Island Grid Coordinate System. Completed monitoring wells will be surveyed for elevation at the top of the protective casing, top of the well casing, and adjacent land surface. Elevations will be referenced to a United States Geological Survey benchmark and mean low water level.

4.0 SITE-SPECIFIC HEALTH AND SAFETY SUMMARY

4.1 INTRODUCTION

The purpose of the site-specific health and safety plan summary is to summarize the site-specific health and safety information. The project Health and Safety Plan (HASP) is provided in Appendix C. This section summarizes the nature of wastes materials reportedly disposed of at the site, the site access and work zones, and the initial levels of personnel protection planned for each site investigation activity. In addition, a list of emergency contacts and a map of the route to the Newport Hospital is provided in Table 2 and on Figures 7 and 7A, respectively.

4.2 NATURE OF WASTES

Available site background information (IAS, 1983) indicates the site area was used for the disposal of scrap lumber, tires, wire, cable, and empty paint cans. In addition, granular fill material may have been placed in this area. Waste characteristics typical of rubble/soil fill areas, namely, fill of heterogeneous composition and irregular densities are anticipated. The disposal of organic debris and the site setting (stream valley) may result in the presence of natural decomposition products such as methane.

Chemical hazards could conceivably include VOCs and heavy metals from paint residues, as well as methane produced from the natural decomposition of organic materials.

4.3 SITE ACCESS/WORK ZONES

Access to the area is restricted through access to the NUWC facility which is completely fenced and guarded. The site is bound to the north by a chain-link fence located between NUWC and a private golf course. Given the steep stream valley topography just south of the site, the bordering woods, and the relative location of the site at the northern end of NUWC, the site is located in a somewhat remote portion of the NUWC.

Site work zones will be established during the site investigation activities. During subsurface explorations (soil borings), the On-site Safety Coordinator (OSC) or designee shall establish a 25-foot exclusion zone around active drill rig operations. The exclusion zone will be demarcated using safety cones and caution tape or barricades. The OSC or designee will be responsible for keeping unauthorized personnel outside the exclusion zone boundaries.

In the event that visitors or unauthorized personnel are present during field activities, the OSC or designee shall ensure that they stay outside of the exclusion zone. All personnel allowed by the OSC to enter the exclusion zone, shall follow the safety procedures described in the project HASP and established by the OSC.

A contamination reduction station, or decontamination area, shall be established adjacent to the exclusion zone. The contamination reduction zone will be established at the upwind side of the exclusion zone and will consist of an area adequate in size to contain decontamination equipment. Personnel exiting the exclusion zone shall undergo appropriate decontamination, as required by the level of protection donned by the personnel.

The support zone for this site will be the company vehicles used by the field investigation crew. The vehicles will provide temporary relief from any adverse weather conditions and will store necessary field sampling and safety/emergency equipment (e.g., mobile phone, first aid kit, drinking water, HASP).

The heavy equipment decontamination area used for this site will be located at the McAllister Point Landfill site. This site is located on NETC just north of the site on Defense Highway. The equipment decontamination area will be the one established at this site for the NETC Remedial Investigations.

4.4 PERSONNEL PROTECTION AND MONITORING

Based on the suspected disposal of inert material and the lack of known or suspected hazardous materials at the site most investigatory activities will be initiated in either Level D or Modified Level D personnel protection (as defined in the HASP). A list of anticipated initial levels of personnel protection for each of the planned investigatory activities is presented in Table 3.

During the field sampling activities, continuous monitoring of ambient air will be conducted with an OVA and HNu. During the drilling activities, continuous ambient monitoring of combustible gases will also be conducted with an LEL/O2 meter. Air monitoring will also be performed "downhole" during drilling operations.

- TABLES -

Study Area 08 - NUSC Disposal Area

TABLE 1

STUDY AREA 08 - NUSC DISPOSAL AREA
SITE INVESTIGATION SUMMARY

RECONNAISSANCE SURVEYS:

Reconnaissance, ambient air, and radiological surveys on 50-foot spaced traverses.

GEOPHYSICAL SURVEYS:

Electromagnetic conductivity and magnetometer surveys on 50-foot spaced traverses.

SOIL GAS SURVEY:

A soil gas survey will be conducted on approximately 100-foot spaced traverses.

SOIL SAMPLING:

Surface Soil:

Surface soil samples will be collected from five (5) locations on-site, and two background locations. Samples will be analyzed for the full TCL/TAL.

Subsurface Soil/Test Borings:

Soil samples will be collected from five (5) test borings and four (4) well borings. Samples will be collected continuously from ground surface to the water table and in five foot increments beyond this depth for ten more feet or to bedrock, whichever comes first. Up to three (3) samples per boring will be analyzed for the full TCL/TAL.

GROUND WATER SAMPLING:

Monitoring Wells:

Monitoring wells will be installed in four (4) locations. One well will be installed upgradient, in the central and western portion of the site, and in the anticipated downgradient direction. Ground water samples will be analyzed for the full TCL/TAL and total chloride. Temperature, pH, conductivity, dissolved oxygen, alkalinity, and salinity of samples will also be determined. Piezometers will also be installed at eight locations adjacent to the streams.

SURFACE WATER/SEDIMENT SAMPLING:

Surface water/sediment sample pairs will be collected from eight (8) locations near the site. The samples will be analyzed for the full TCL/TAL, TOC, and grain size distribution. Temperature, pH, conductivity, dissolved oxygen, alkalinity, salinity, and hardness will also be determined.

LAND SURVEY:

A professional land survey will be conducted of site features and sampling points.

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TABLE 2

SITE 08 - NUSC DISPOSAL AREA
SITE EMERGENCY CONTACTS

NUSC Emergency Numbers:

Command Duty Officer	*841-3124*
Security Office - Police	*841-4296*
NUSC Fire Protection	*841-3333*
U.S. Coast Guard	*846-3675*

Utilities:

Rhode Island Dig Safe	*800-225-4977*

Newport Emergency Numbers:

Newport Police Dept.	*847-1306*
Newport Fire Dept.	*846-2211*
Newport Hospital	
General Number	*846-6400*
Emergency Room	*846-6400 ext. 1120*
Poison Control Center	*277-5727*

Additional Resources:

Dr. Erdil, or Dr. Stahl - TRC Company Physicians - Immediate Medical Care, Hartford, Connecticut (203) 296-8330
Mr. James Peronto - TRC Project Manager - (203) 289-8631
Ms. Rachel Marino - NETC Environmental Coord. - (401) 841-3735
Mr. Robert Hanley - NETC Safety Officer - (401) 841-2478

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TABLE 3

STUDY AREA 08 - NUSC DISPOSAL AREA
PERSONNEL PROTECTION SUMMARY

Activity	*Level of Protection*
Geophysical Survey	*D*
Soil Gas Survey	*D*
Surface Soil Sampling	*D*
Soil Borings	*D*
Ground Water Sampling	*Mod. D*
Surface Water and Sediment	*Mod. D*

NOTE: *The above list of personnel protection levels will be up or downgraded as conditions warrant according to criteria outlined in the project Health and Safety Plan (HASP).*

TRC

TABLE 4

Study Area 08 - NUSC Disposal Area
Surface Soil Sample Location Rationale

SAMPLE NUMBER	LOCATION / RATIONALE
SS-1	Determine the presence of surface soil contamination in the eastern corner of site.
SS-2	Determine the presence of surface soil contamination in the eastern central portion of the site.
SS-3	Determine the presence of surface soil contamination in the eastern central portion of the site.
SS-4	Determine the presence of surface soil contamination in the central portion of the site.
SS-5	Determine the presence of surface soil contamination in the western portion of the site.
SS-6	Determine the site background surface soil quality.
SS-7	Determine the site background surface soil quality.

TABLE 5

Study Area 08 - NUSC Disposal Area
Test Boring Location Rationale

TEST BORING NUMBER	LOCATION / RATIONALE
B-1	Determine subsurface soil quality and fill characteristics in the eastern portion of the site.
B-2	Determine subsurface soil quality and fill characteristics in the eastern portion of the site.
B-3	Determine subsurface soil quality and fill characteristics in the central portion of the site.
B-4	Determine subsurface soil quality and fill characteristics in the central portion of the site.
B-5	Determine subsurface soil quality and fill characteristics in the western plateau portion of the site.

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TABLE 6

Study Area 08 - NUSC Disposal Area
Monitoring Well Location Rationale

WELL NUMBER	LOCATION / RATIONALE
MW-1	Investigate the ground water quality upgradient of the site.
MW-2	Investigate ground water quality in the eastern portion of the site.
MW-3	Investigate ground water quality in the western portion of the site.
MW-4	Investigate ground water quality and flow direction in the far western portion of the site.

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TABLE 7

Study Area 08 - NUSC Disposal Area
Surface Water/Sediment Sample Location Rationale

LOCATION NUMBER	LOCATION / RATIONALE
SW-1/SD-1	Determine the surface water and sediment quality upstream of the site to aid in determining background stream quality.
SW-2/SD-2	Determine the surface water and sediment quality in the central eastern portion of primary stream near suspected fill area.
SW-3/SD-3	Determine the surface water and sediment quality in central portion of the site in the primary stream and downstream of fill area.
SW-4/SD-4	Determine the surface water and sediment quality at the upstream edge of the site in the small secondary on-site stream; will provide background stream quality information.
SW-5/SD-5	Determine the surface water and sediment quality at the downstream edge of the site in the small secondary on-site stream just down stream of the site and fill area.
SW-6/SD-6	Determine the surface water and sediment quality just downstream of the confluence of the two streams and the site.
SW-7/SD-7	Determine the surface water and sediment quality at the mouth of the pond located downstream of the site.
SW-8/SD-8	Determine the surface water and sediment quality at the outfall of the pond located downstream of the site.

- FIGURES -

Study Area 08 - NUSC Disposal Area

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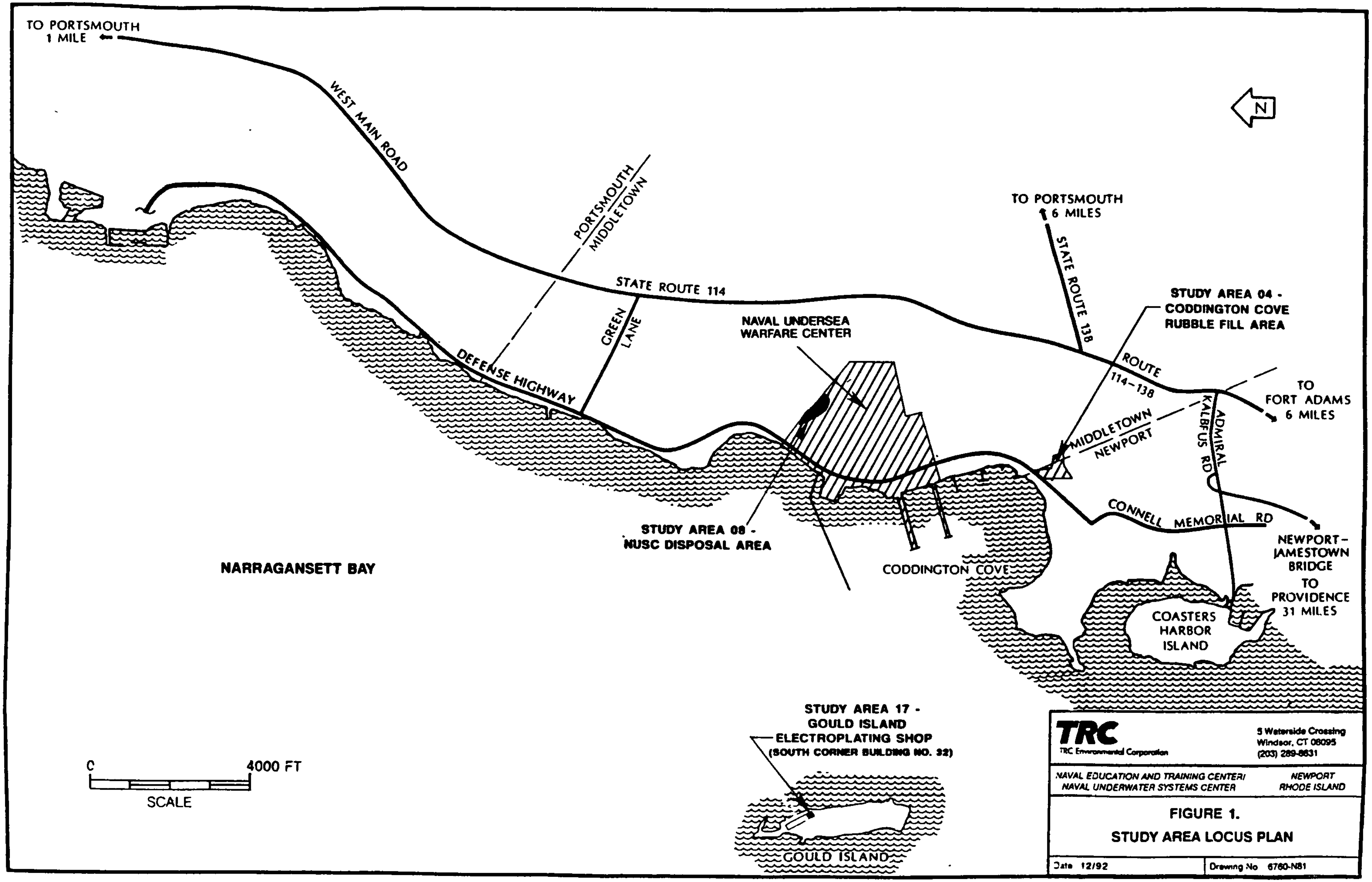
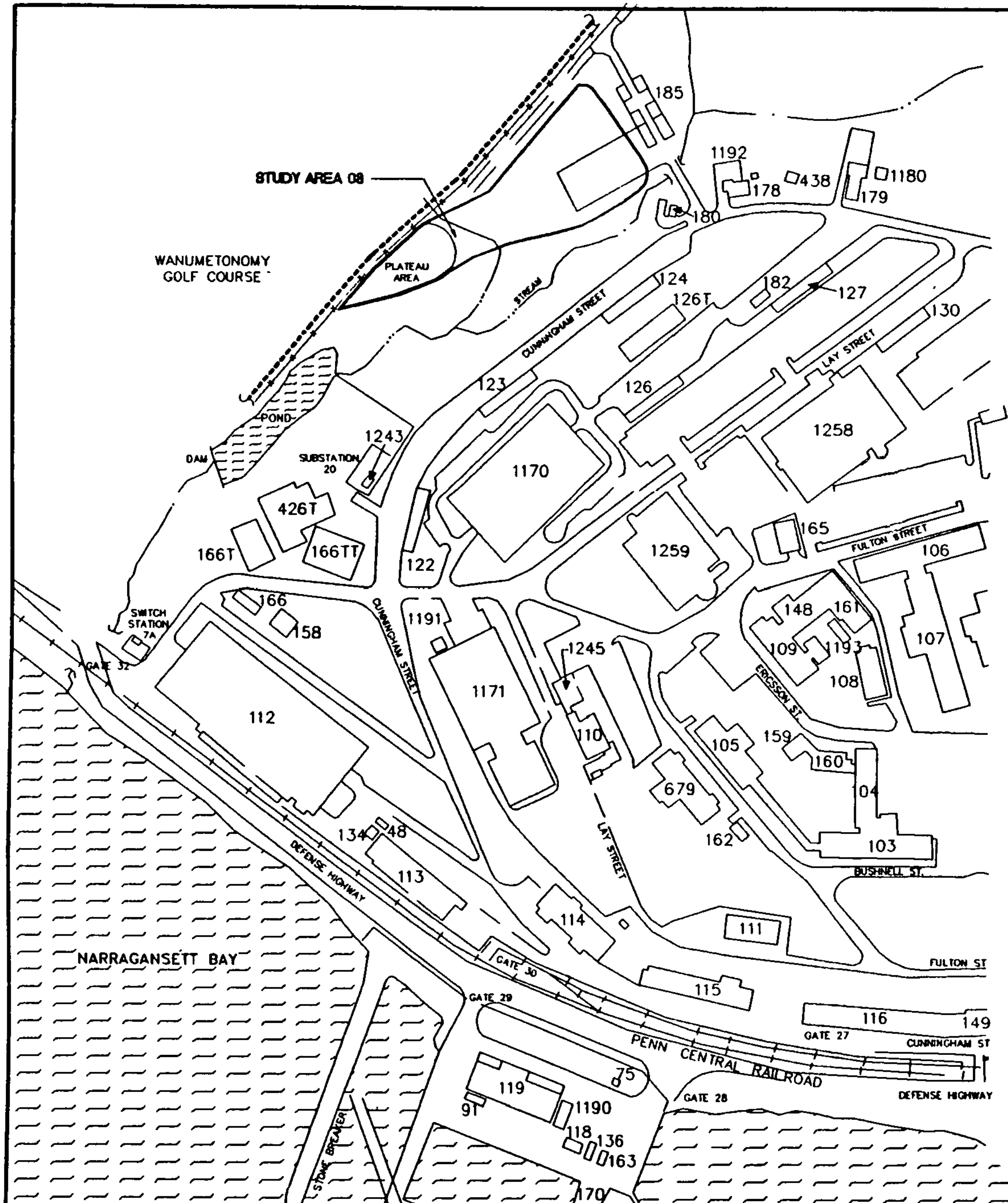


FIGURE 1.
STUDY AREA LOCUS PLAN



LEGEND

NAVY PROPERTY LINE

SITE BOUNDARY

NOTE.

BASE MAP DEVELOPED FROM CAD DRAWING PROVIDED BY U S NAVY NETC PUBLIC WORKS DEPARTMENT, 4/92

0 600 FT

SCALE

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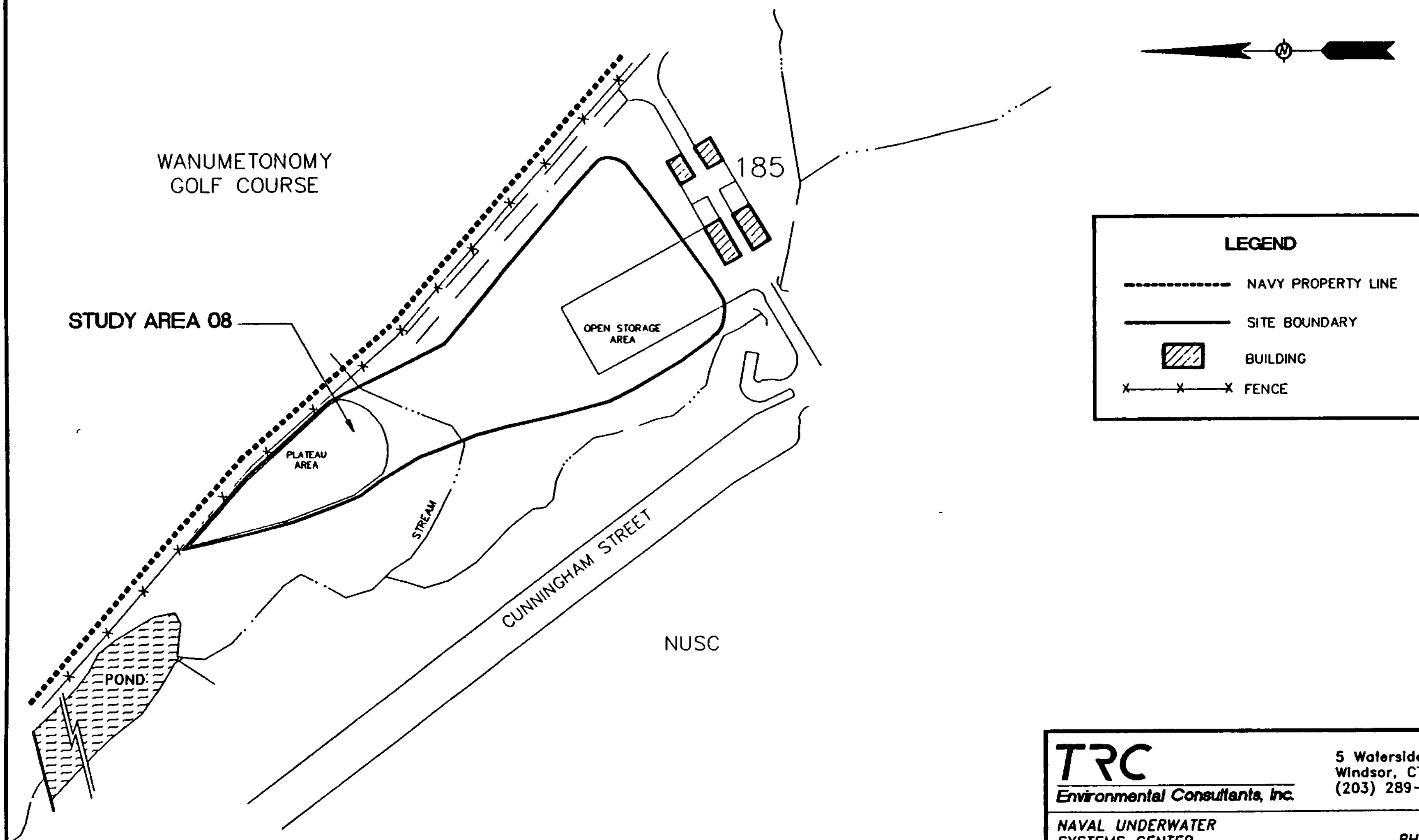
NAVAL UNDERWATER SYSTEMS CENTER — NEWPORT RHODE ISLAND

STUDY AREA 08 - NUSC DISPOSAL AREA

FIGURE 2.
SITE LOCUS

Date: 4/92 | Project No. 6760-N81



NOTE

BASE MAP DEVELOPED FROM CAD DRAWING PROVIDED BY U.S NAVY NETC PUBLIC WORKS DEPARTMENT, 4/92

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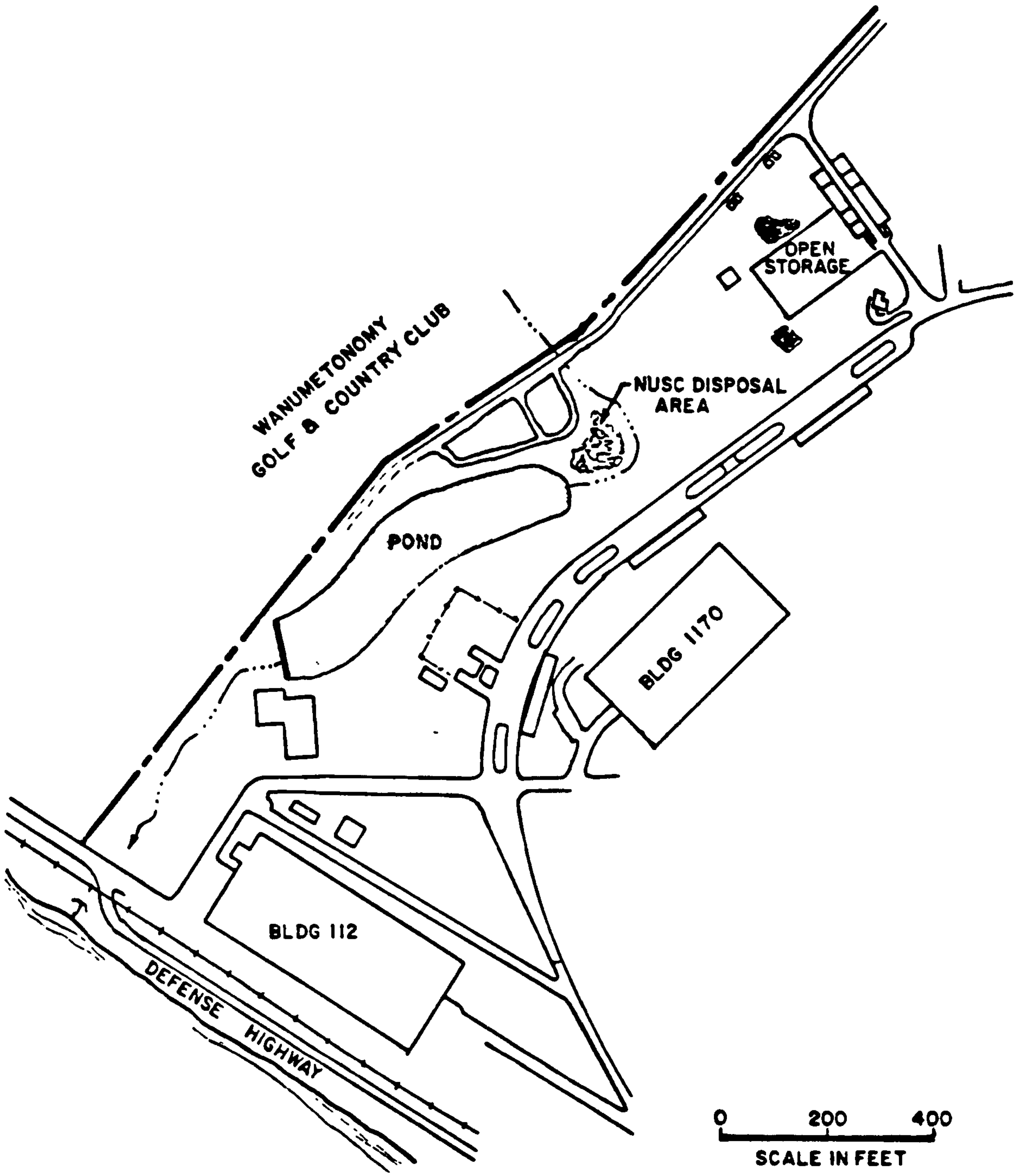
STUDY AREA 08 - NUSC DISPOSAL AREA

FIGURE 3.

SITE MAP

Date: 4/92 | Project No. 6760-N81



SOURCE: INITIAL ASSESSMENT STUDY REPORT
(ENVIRODYNE, 1983).

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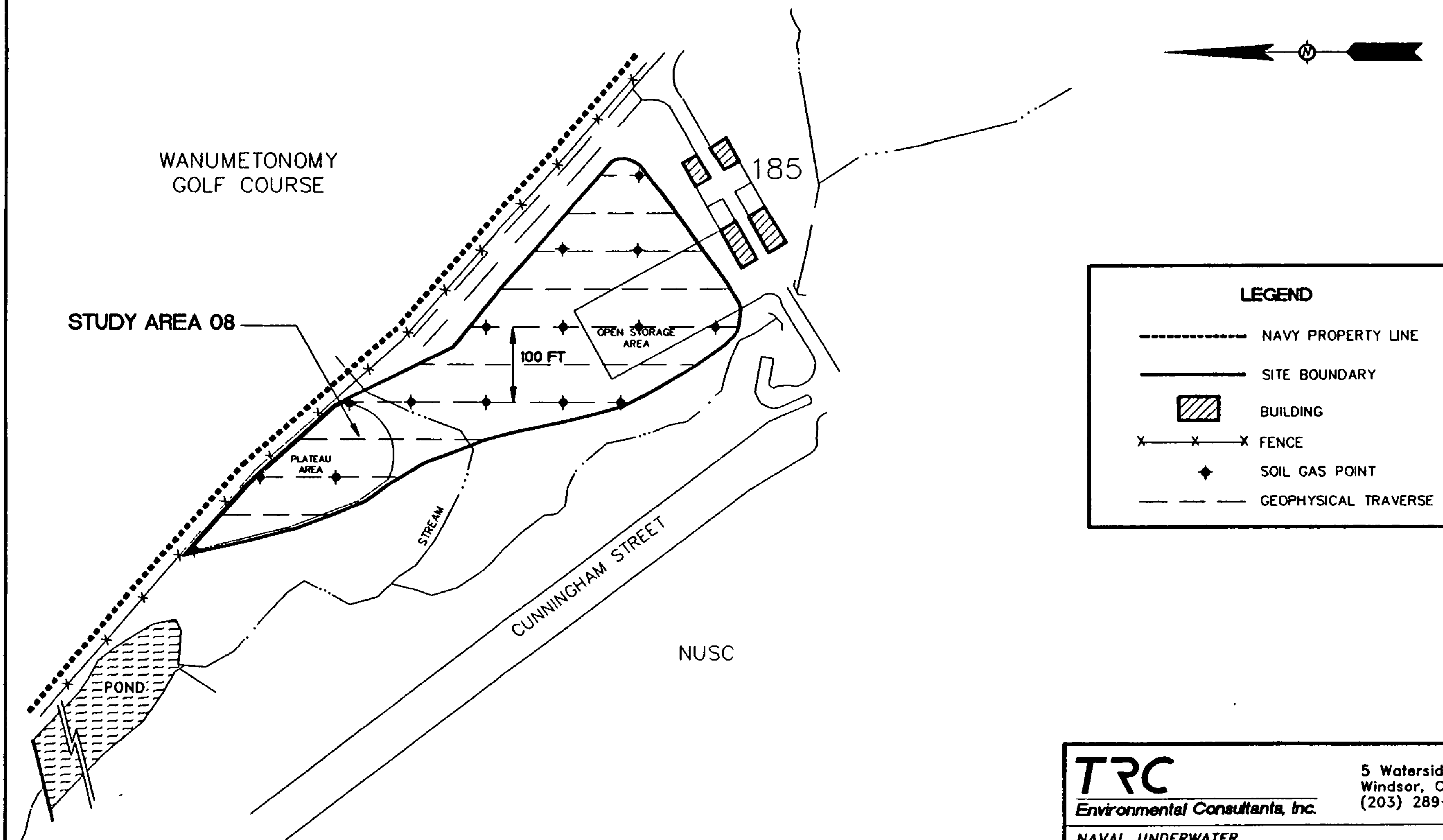
FIGURE 4.

IAS SITE MAP

Date. 4/92 | Drawing No : 6760-N81



NOTE
BASE MAP DEVELOPED FROM CAD DRAWING PROVIDED BY U.S. NAVY NETC PUBLIC WORKS DEPARTMENT, 4/92.

0 600 FT
SCALE

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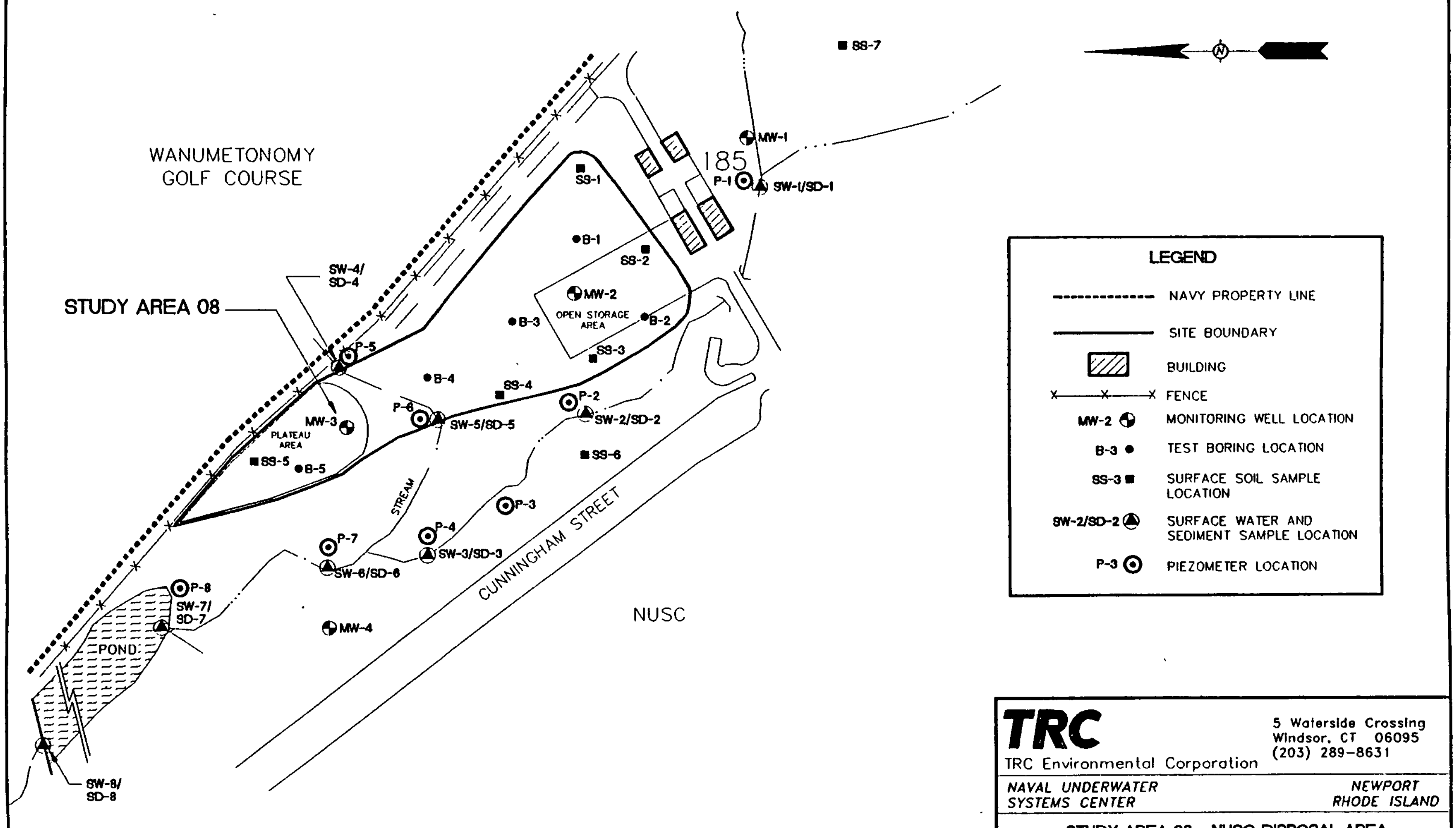
STUDY AREA 08 - NUSC DISPOSAL AREA

FIGURE 5.
SITE SURVEY LOCATION MAP

Date: 4/92
Project No. 6760-N81



NOTE

BASE MAP DEVELOPED FROM CAD DRAWING PROVIDED BY U.S. NAVY NETC PUBLIC WORKS DEPARTMENT, 4/92

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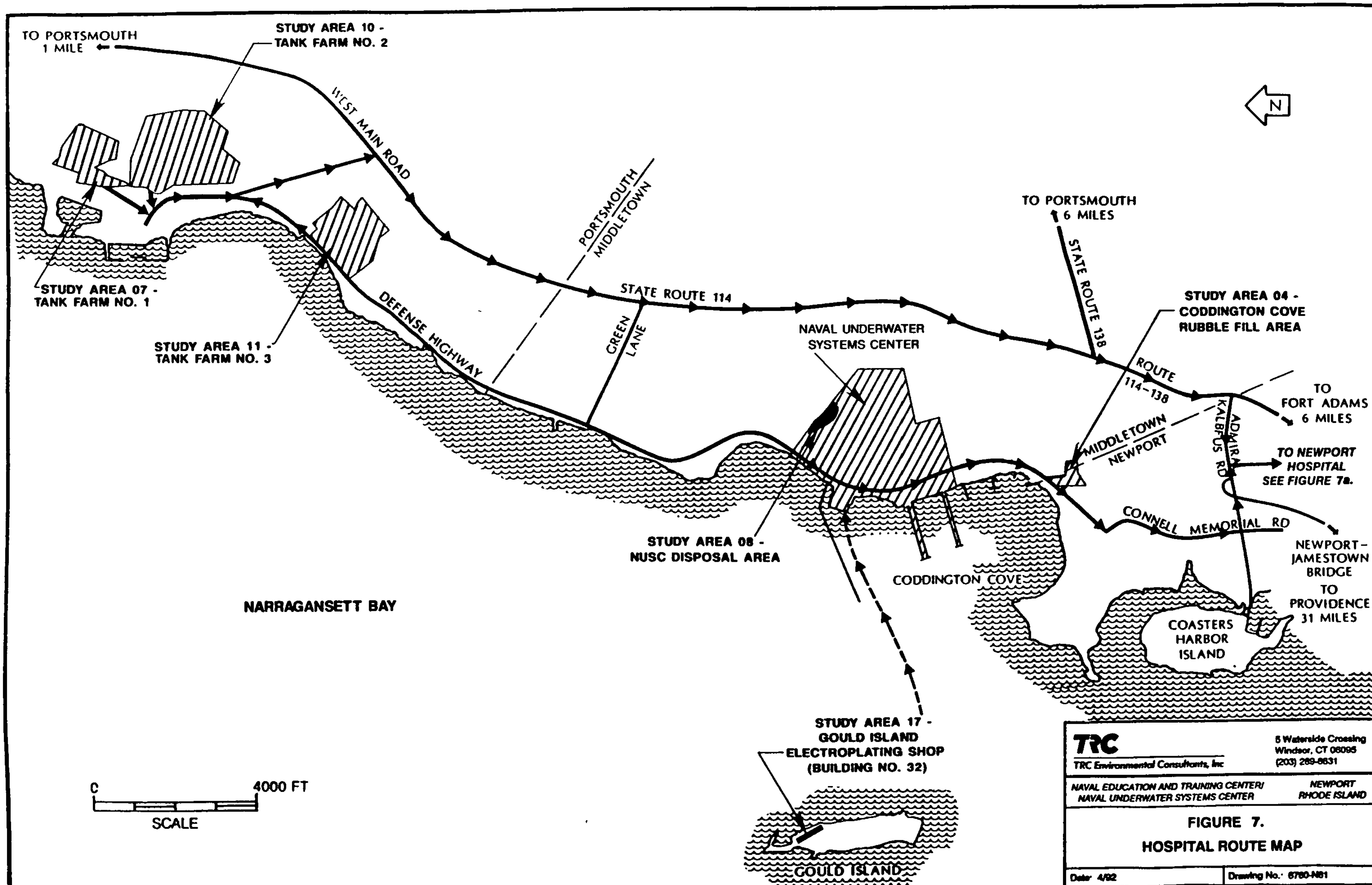
STUDY AREA 08 - NUSC DISPOSAL AREA

FIGURE 6.

SITE INVESTIGATION SUMMARY MAP

Date: 12/92	Project No. 6760-N81-100



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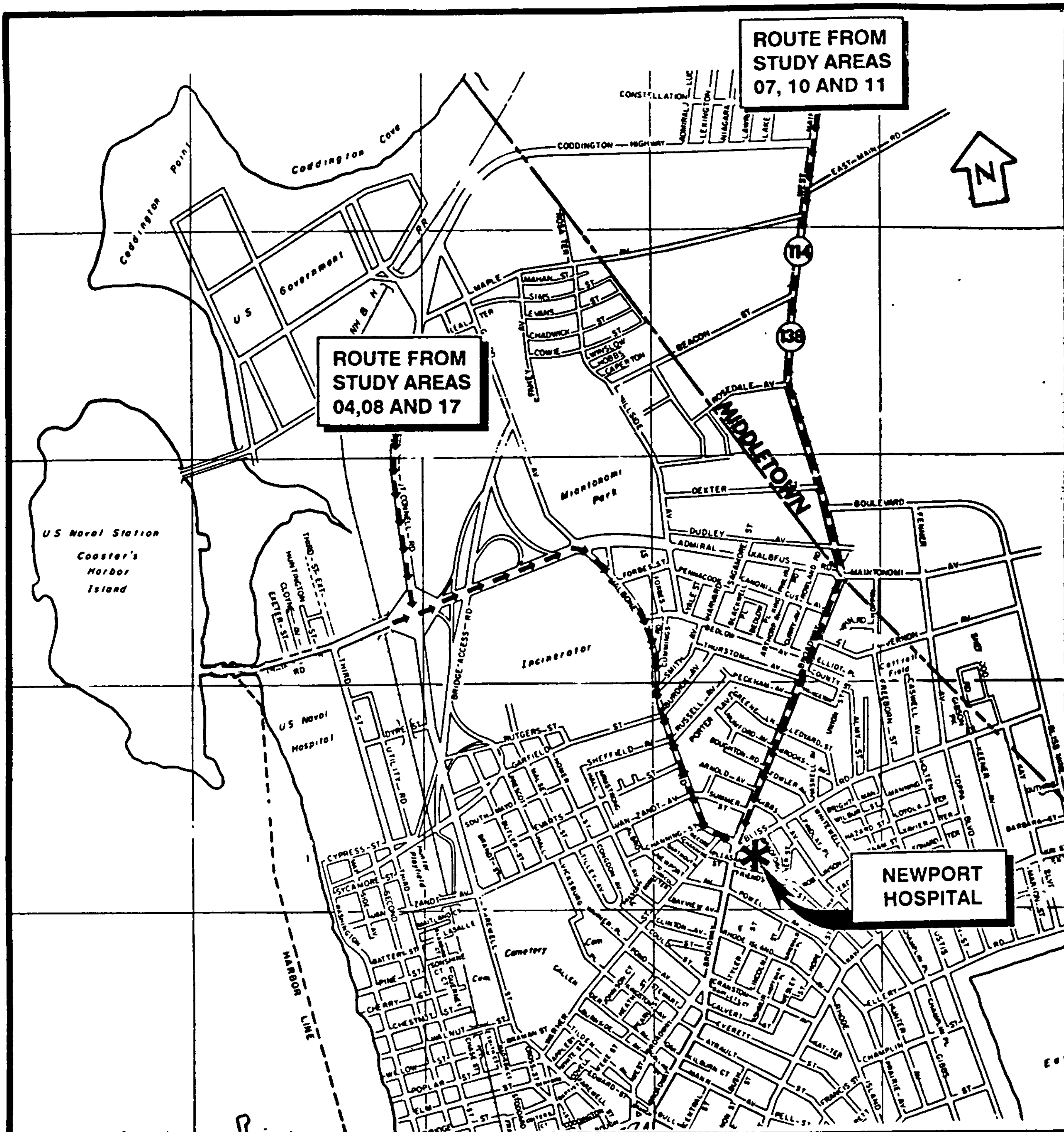
NAVAL UNDERWATER SYSTEMS CENTER

NEWPORT
RHODE ISLAND

FIGURE 7.

HOSPITAL ROUTE MAP

Date: 4/92 | Drawing No.: 6760-N81



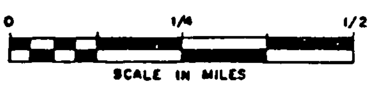


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FIGURE 7a.

NEWPORT HOSPITAL ROUTE MAP

Date: 4/92	Drawing No.: 6760-N81

APPENDIX A
EXISTING CONDITIONS MAP

Study Area 08 - NUSC Disposal Area

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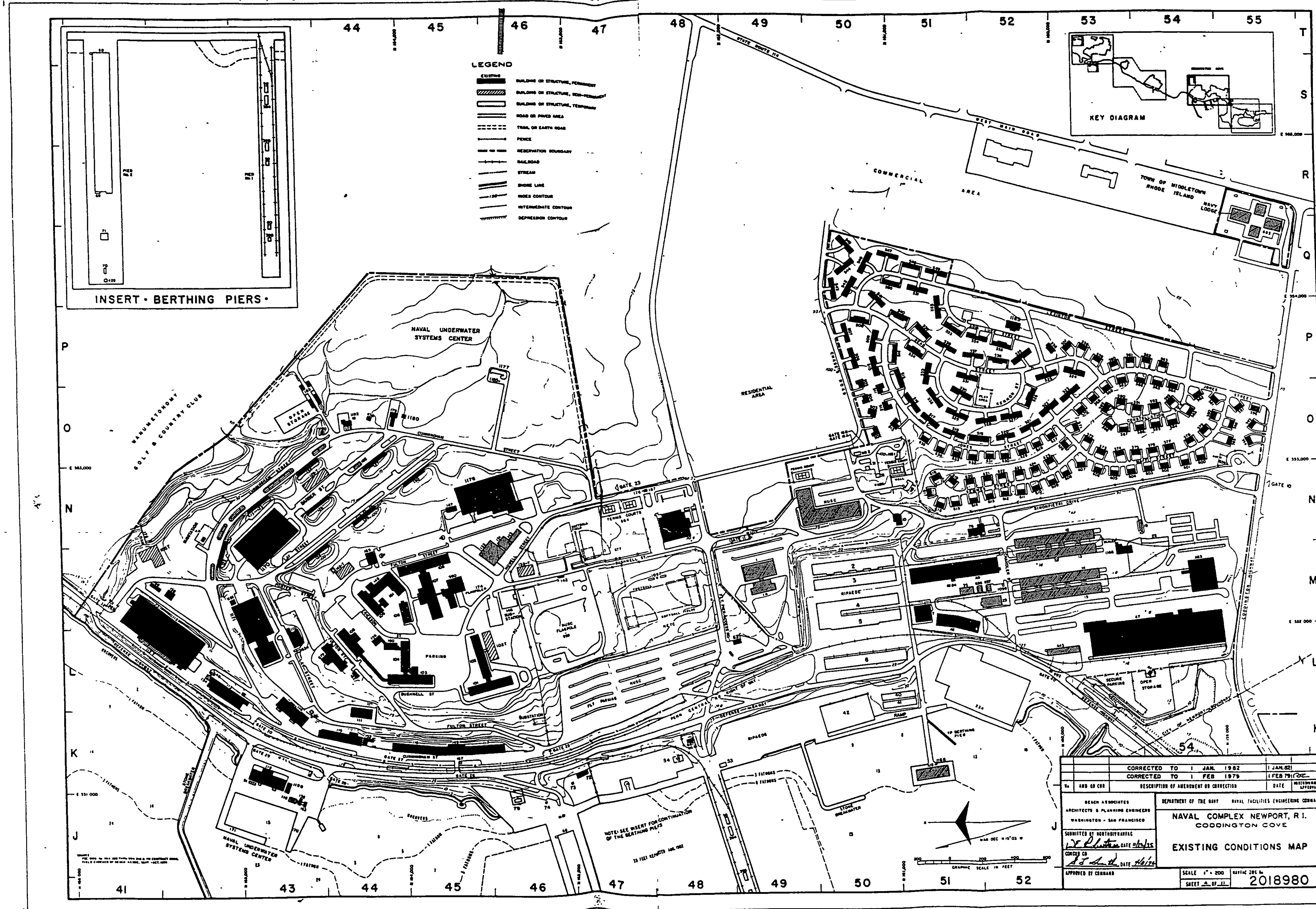
INSERT • BERTHING PIERS •
LEGEND
KEY DIAGRAM
NAVAL UNDERWATER SYSTEMS CENTER
RESIDENTIAL AREA
COMMERCIAL AREA
TOWN OF MIDDLETOWN RHODE ISLAND
NAVY LODGE
WANUMETONOMY GOLF & COUNTRY CLUB
NOTE: SEE INSERT FOR CONTINUATION OF THE BERTHING PIERS
CORRECTED TO 1 JAN. 1982
CORRECTED TO 1 FEB 1979
DESCRIPTION OF AMENDMENT OR CORRECTION
BEACH ASSOCIATES
ARCHITECTS & PLANNING ENGINEERS
WASHINGTON - SAN FRANCISCO
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
NAVAL COMPLEX NEWPORT, R.I.
CODDINGTON COVE
EXISTING CONDITIONS MAP
APPROVED BY COMMAND
2018980

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

VOLUME III
-GOULD ISLAND ELECTROPLATING SHOP-
STUDY AREA 17

STUDY AREA SCREENING EVALUATION
WORK PLAN
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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A TRC Company

TABLE OF CONTENTS

Page

VOLUME III - GOULD ISLAND ELECTROPLATING SHOP

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TABLE OF CONTENTS

VOLUME III - GOULD ISLAND ELECTROPLATING SHOP

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The objective of this volume of the Work Plan is to define the level of investigation necessary to assess the presence and nature of environmental contamination at Study Area 17, the Gould Island Electroplating Shop located on the Naval Undersea Warfare Center (NUWC) controlled portion of Gould Island in Narragansett Bay. This volume of the Work Plan describes site-specific investigation objectives in Section 1.1, summarizes available site background information in Section 2.0, presents the site-specific field sampling plan in Section 3.0, and summarizes site-specific health and safety information in Section 4.0.

1.1 SITE-SPECIFIC INVESTIGATION OBJECTIVES

The investigation objectives for this site are to assess if environmental contamination is present as a result of former electroplating activities and to assess potential pathways for releases of hazardous substances to off-shore sediments and biota. The investigation objectives will be achieved through a focused program of investigation which is based upon previous investigation findings and site background information.

The site screening evaluation will assess the presence of releases of hazardous substances to soil and ground water and potential off-shore sediment and biota. The site investigation program will include a reconnaissance survey, geophysics, tank and floor drain residue sampling, sub-slab soil sampling, and off-shore sediment and biota sampling as described in Section 3.0.

Given the available site background information, the investigation program is planned to document the presence of any environmental contamination and potential threats to human health and the environment. The findings of the investigation will be used to assess the need for any further environmental studies and the scope of any such studies. If the findings of the site investigations indicate the presence of site-related environmental contamination, additional investigation activities and/or limited response actions (e.g., removals) may be conducted at the site.

2.0 SITE BACKGROUND INFORMATION

2.1 SITE LOCATION

Gould Island is located in the East Passage of Narragansett Bay approximately 1.5 miles from the NETC shoreline. The Gould Island Electroplating Shop (Study Area 17) is located in Building 32 on the northeast end of Gould Island. The location of the Gould Island Electroplating Shop, relative to the other study areas within the Newport Naval Base, is shown on Figure 1.

Gould Island is located between Aquidneck and Conanicut Islands and occupies approximately 52 acres. A map of Gould Island is provided with the Background Information in Appendix A. Building 32 is located at the northeastern tip of Gould Island. The Gould Island Electroplating Shop is a room located in the southwestern corner of Building 32.

2.2 SITE DESCRIPTION

The Gould Island Electroplating Shop occupies a room with approximate dimensions of 95 feet by 45 feet room (4,275 square feet) in the southwestern portion of Building 32 on Gould Island. The location of the electroplating shop within Building 32 on Gould Island is shown on Figure 2.

A floor plan of the plating shop is shown on Figure 3, as adapted from a previous report (ENSR, 1992) and observations made during a recent site visit. A doorway in the northern corner of the plating provides access from the main portion of the building. The plating shop room consists of numerous square metal open top vats ("baths"), two concrete open top round tanks ("pits"), several wooden benches, a small sandblasting room, a motor generator room, a small "acid dipping room", a small office, and floor trenches and drains. The metal vats in the room range is size from approximately 3 feet wide by 5 to 15 feet long. The two metal pits are approximately 4 feet in diameter by 8 feet deep, with most of each tank extending below the floor of the room. A small bathroom is attached off of the northern corner of the plating room. As described further in Section 2.2.1, these features were observed during a recent site visit.

The floor of the electroplating shop is of concrete construction with a series of open top floor trenches and floor drains. As shown on Figure 3, the floor trenches are located along the eastern and western walls of the room and in the central portion of the shop. The open top trenches are partially covered with metal grates. The layout of the subsurface piping associated with the trenches and drains is unknown.

2.2.1 Site Observations

On March 25, 1992 TRC-ECI personnel visited the subject study area. Significant observations included during the site visit included the following:

- Numerous metal vats were observed within the plating room. The location and orientation of the vats was generally consistent with that described shown on Figure 4, as adapted from the Waste Sampling and Analysis Plan (ENSR, 1992).
- A series of three trench drains were observed running along the floor of the room. These drains were located along the long axis of the plating room, one on each side of the room with the third in the middle. These trench drains were partially covered with metal grates.
- Several discrete floor drains were observed in the concrete floor of the plating shop.
- Small quantities of waste residues consisting of what appeared to be plating sludges were observed in the metal plating vats.
- Overhead signs were observed above several tanks. Individual signs read Chromic Acid, Muriatic Acid, Anodex Cleaner, Sulfuric and Nitric Acid, and Caustic Soda.

2.3 SITE HISTORY

Available information (Envirodyne, 1983) indicates that both electroplating and degreasing operations were conducted in Building 32 in the mid-1940's during World War II. Building 32 was used as a torpedo overhaul and storage shop during the war. The building includes the plating shop, a grinding and buffing shop, degreasing units, and equipment formerly used to overhaul torpedoes.

The disposal location of waste materials generated from the plating activities are unknown. However, the IAS Report (Envirodyne, 1983) suggests that wastewater discharges may have been routed to either a septic system or to off-shore outfall pipes. The Confirmation Study report (Louriero, 1986) suggested that the plating sludges were probably disposed of in a disposal area which is located on west side of the Gould Island (Site 14).

2.3.1 Aerial Photography

Aerial photographs dating from 1942, 1951, 1963, 1965, 1970, 1975, 1981, and 1988 were reviewed at the Rhode Island Department of Administration, Division of Planning. In general, the aerial photography was of minimal use in evaluating potential impacts or the extent of contamination at this study area due to the physical location of the plating shop being inside the building and the lack of any observable outfall location(s) in the bay.

2.4 PREVIOUS SITE INVESTIGATIONS

An Initial Assessment Study conducted at NETC (IAS, Envirodyne Engineers, 1983) identified areas where potential contamination from past waste disposal or handling practices may pose human health or environmental risks. The Gould Island Electroplating shop was reviewed in the IAS. Based upon the use of the southwestern portion of Building 32 as an electroplating shop and the unknown location of electroplating shop waste disposal, further investigation was recommended in the IAS.

A Confirmation Study (CS) was subsequently conducted of the Gould Island Electroplating Shop (Louriero Engineering, 1986). The Confirmation Study indicated that two discharge pipes were present directly east of Building 38 in Narragansett Bay. The locations of the discharge pipes are shown on Figure 4. The end of one of the discharge pipes was located during the CS. The end of the other pipe was not located, reportedly due to the presence of silt and vegetation over the pipe.

Under the Verification Step of the CS, both sediment and mussel samples were collected from two locations in Narragansett Bay. Sampling Station 01 was located just beyond the outlet of the northernmost discharge pipe and Station 02 was located near the anticipated locations of the outlet of the southern discharge pipe.

Sediment samples were collected from Stations 01 and 02 approximately 25 feet off-shore in one to three feet of water. The sediment deposits from which the samples were collected were reportedly stony silt and sand collected from a depth of 0 to 4 inches. The mussel samples were collected from the intertidal zone shoreward of sediment sampling Stations 01 and 02.

Sediment and mussel samples were analyzed for metals (Cr, CD, PB, Hg, Ag, Cu, and Ni) and cyanide as reported in the CS report (Table 46) and provided in Appendix A. Sediment and mussel samples were also collected from two control stations (N1 and N2) and analyzed for metals and cyanide. The control station sediments were reported as being stony at both locations, particularly at Station N1. The mussel controls were repeated in the Characterization Step to account for any temporal variations.

According to the CS report, the Verification Step sample results "...indicate that slightly elevated concentrations of cyanide and copper are present in sediments and an elevated concentration of copper is present in mussels collected from the vicinity of one of the discharge pipes...". This judgement was based upon a comparison of the site sample results with the control station sample results.

The Verification Step sample data does show that cyanide and copper were detected at concentrations higher (approximately four times greater) than those detected in the control samples. In addition, copper was also detected at a higher concentration in the Station 02 sediment sample (26.3 ppm) than that detected in the Station 01 sediment sample (6 ppm) and the control sediment samples (4.3 and 7.2 ppm)

Under the Characterization Step of the CS, the mussels at Station 02 were resampled as a check on the metals concentrations detected previously in the Verification Step. This mussel sample was analyzed for lead, copper, chromium, and nickel. These sample results are presented in a table from the CS report (Table 48) provided in Appendix A. The sample results indicate that the detected metals concentrations differ slightly from those detected previously at that sample location, but that they are similar to those detected in the control samples.

Based upon the findings of the CS, it was recommended that "no further studies or remedial actions are needed at this site because the levels of contaminants found are not significantly high" (CS, 1986).

More recently, a Waste Inventory and Sampling Report (ENSR, 1992) was prepared to inventory and characterize waste materials present in Buildings 32 and 35 on Gould Island. This program was undertaken to identify and characterize wastes materials to allow the Navy to contract for the removal of these materials prior to the planned demolition of these buildings.

A total of eight discrete samples (T-16, T-17, and T-24 to T-29 inclusive) were collected from within the electroplating room and one from a manhole (T-30) located just outside f the doorway leading into the electroplating room. The location of these sampling points is shown on Figure 5. A summary of sample identification numbers, sample locations, sample matrix, and estimated waste quantities at each of the sample locations is provided in Table 2.

Five aqueous samples (T-16, T-17, T-24, T-25, and T-26) were analyzed for corrosivity (pH), reactivity (cyanide and sulfide reactive), flashpoint, PCB's, and all Toxicity Characteristic Leaching Procedure (TCLP) parameters. Samples T-25 and T-26 were specifically referred to as "plating solutions" on report figures. The TCLP sample results of the five discrete samples showed concentrations of lead (7.8 mg/l) in sample T-25, and lead (5.7 ppm) and cadmium (7,000 ppm) in sample T-26 at levels greater than the hazardous waste characterization regulatory limits (40 CFR Part 261 Subpart C) for lead (5.0 ppm) and cadmium (1 ppm). Both of these samples were collected from vats located in the "acid dipping room" portion of the electroplating room.

In addition, two composite samples (Composite 1 and Composite 2) were also collected and analyzed for a broad range of parameters to further characterize the materials for disposal purposes. Composite sample 1 consisted of samples T-16, T-17, T-24, T-25, T-28, T-29, and T-30. Whereas, composite sample 2 consisted of samples T-26 and T-27. All but one of these samples, sample T-30, were collected from within the electroplating room area. Sample T-30 was an aqueous sample collected from a manhole catch basin located just outside of the entrance into the electroplating room.

The two composite sample analyses included BTU value, flashpoint, corrosivity (pH), reactivity (sulfide and cyanide), priority pollutant volatiles, priority pollutant semivolatiles, priority pollutant pesticides/PCBs, and metals (Sb, As, Cd, Cr, Pb, Mn, K, Na, and Sr). The composite sample results are provided with the site background information in Appendix A.

The analytical results of the two composite samples indicate concentrations of heavy metals in both samples. Elevated levels of total cadmium (8,080 ppm) and lead (11 ppm) were detected in composite sample 2. In addition, low levels of a volatile organic compound (bromomethane @ 19 ppb) and semivolatile organic tentatively identified organic compounds (TICs @ 1,476 ppb) were detected in composite sample 2.

Another sample (MH-1) potentially associated with the electroplating room operations, was collected from a manhole located approximately 20 feet from the southeast corner of Building 32. The location of this manhole is shown on Figure 5. This sample was collected as part of composite sample 3 which consisted of nine sample aliquots from the southern portion of Building 32 (not including the electroplating room). The composite sample included samples from floor trench samples near prior solvent storage areas, a grinding room vat, and the manhole water sample.

The analytical results of composite sample 3 showed concentrations of total metals, two volatile organic compounds at low concentrations (chlorobenzene @ 14 ppb and trichloroethane @ 16 ppb), and low concentrations of semivolatile organic compounds (pyridine @ 720 ppb and TICs @ 2,368 ppb).

Composite sample No. 3 indicated hazardous concentrations of cadmium (2.10 mg/l). Composite sample No. 3 is comprised of discrete samples T-6 (L1 and L2), T-7, T-8, T-9, T-10, T-12, T-22, T-23, and MH1, representing a total of approximately 2,521 gallons of fluid.

2.5 SITE HYDROGEOLOGY AND GEOLOGY

Historic information (U.S. Navy, 1959) indicates that four wells were drilled on Gould Island in the early 1940's. These four wells were installed at different locations across the island. A map showing the location of the wells is provided in the site background information in Appendix A. Two of the wells were reportedly advanced to a depth of 330 feet, while the remaining two wells were advanced to a depth of approximately 530 feet. No additional information (e.g., construction or boring logs) was available on the wells.

The reported flow capacities of the two 330-foot wells and two 530-foot wells were 7 to 35 gpm and 6 to 10 gpm, respectively. The yield of the wells was deemed inadequate to support island needs and therefore, a fresh water supply line was extended from Aquidneck Island. (U.S. Navy, 1943 and U.S. Navy, 1959)

According to the August 29, 1959 Newport Area of Public Works Data Book, Gould Island receives water from an eight inch water main from the Newport Municipal Water Works located on Aquidneck Island.

Based upon a review of Gould Island topography and the island setting, shallow ground water flow is anticipated to be to radially outward from the center of the island towards Narragansett Bay. According to the IAS report (Envirodyne, 1983), ground water on Gould Island "is generally within a depth of 10 feet".

Gould Island is located within a Rhode Island DEM unclassified ground water zone. Therefore, Gould Island is presumed by the DEM to be GA Class ground water.

While no public supply wells are present on Gould Island, the Prudence Island Broadway well is the closest public ground water supply well. This well is located approximately 4.5 miles north of the study area across Narragansett Bay. The relative location of the site and this well are shown on Figure 6 of the Introduction to this Work Plan.

An NUS Final Target Memo (NUS, 1991) indicates;

> "There are no drinking water supply wells nor any non-drinking water uses of groundwater on Gould Island (Reilly 1991b, 1991e). Based on the assumption that Narragansett Bay represents an aquifer discontinuity surrounding Gould Island, no groundwater resources within 4 miles of the Gould Island Electroplating property are potentially affected." (pg. 2)

2.6 SITE WASTE CHARACTERISTICS

Historical site information (IAS, 1983) indicates the use of the following chemicals at the Gould Island Electroplating Shop:

- Hydrochloric Acid,
- Sulfuric Acid,
- Nitric Acid,
- Chromic Acid,
- Copper Cyanide
- Sodium Cyanide,
- Sodium Hydroxide,
- Nickel Sulfate and,
- Degreasing Solvents

As presented in Section 2.4, hazardous concentrations of lead and cadmium were detected in tank residue samples. In addition, elevated concentrations of cyanide and copper were reported in sediment and mussel samples collected under the 1986 Confirmation Study.

Chemical hazards including volatile organic compounds (VOCs), heavy metals, and cyanide may be present in site wastes, soil, and off-shore sediments.

3.0 SAMPLING PLAN

3.1 INTRODUCTION

The program of investigation described in this section has been developed to achieve both overall and site-specific objectives. Field sampling methodology for individual investigation activities (e.g., surface soil sampling, biota sampling) is described in the Field Sampling Methodology Plan discussion provided as Appendix B of the Work Plan. The quality assurance/quality control procedures for field sampling and laboratory analyses are presented in the project Quality Assurance/Quality Control (QA/QC) Plan provided in Appendix D. A summary of the Gould Island Electroplating Shop sampling program is presented in Table 1. The planned site surveys and sample locations (site and offshore) are shown on Figures 6, 7, and 7a, respectively. The rationale for the investigation sample locations is provided in Tables 5 through 7.

3.2 RECONNAISSANCE SURVEYS

Prior to initiating sampling activities, a site walkover will be conducted by the TRC sampling team members to familiarize themselves with site conditions. The site will be visually surveyed with respect to access restrictions, sampling locations, and establishment of appropriate survey grids. Site-specific health and safety considerations, including emergency evacuation procedures, will be reviewed. Pertinent features, such as overhead and subsurface utilities, and other potential hazards, will be reviewed with Navy personnel with respect to affected sampling activities.

Following completion of the walkover survey, an ambient air and radiological survey will be conducted at the site. This survey will be conducted throughout the electroplating room and in each of the vats and pits. In addition, accessible floor penetrations/openings (drains, trenches, pits, etc.) will be surveyed. The ambient air survey will be conducted with both flame and photo-ionization detectors to assess ambient conditions for the presence of volatile organic compounds (VOCs).

The radiological survey will be conducted with an alpha/beta and gamma meter (sodium iodide scintillation meter) to assess the presence of any radiologic hazards on the site. In addition, an LEL/O2 meter will be used during the survey to evaluate the combustible gas and oxygen conditions in the site building and at the planned sampling locations. The ambient air and radiological surveys will be completed using the equipment and procedures described in Appendix B. If radiation readings above measured general area background values are observed during the surveys, the location(s) of any elevated radiation readings will cordoned off for further assessment by a certified health physicist. Immediate notification of the discovery of any such locations will be given to the EPA and RIDEM by the Navy.

In addition, given the documented and observed presence of asbestos in nearby buildings, ambient air monitoring for the presence of asbestos will be conducted during the site reconnaissance surveys. Both personal and stationary pumps will be used to collect air samples for asbestos analysis. Two floor dust samples will also be collected for asbestos analysis from the electroplating room and just outside of the entrance to the room in Building 32. This sampling and testing is being conducted to assess the presence of any asbestos exposure concerns to the field investigation personnel.

3.3 GEOPHYSICAL SURVEYS

Electromagnetic (EM-31) and ground penetrating radar (GPR) surveys are planned at areas outside of Building 32 near the study area. These surveys will be used to aid in locating subsurface utilities (e.g., drains, supply pipes) potentially related to the electroplating room operations. Given the presence of many interferences (e.g., buildings, power lines, fences) in the planned area of the survey, the effectiveness of the geophysical surveys is uncertain.

The geophysical surveys will be conducted continuously on 10-foot spaced traverses as shown on Figure 6. Although continuous EM readings will be observed during the EM survey, the EM readings will be recorded at 10-foot intervals. In addition, any EM readings which are observed to significantly deviate from normal (e.g., negatives, highs, lows) between the grid points will also be recorded.

3.4 SOIL GAS SURVEY

A soil gas survey is planned under the floor slab of the electroplating shop and at areas outside of Building 32 adjacent to the site. The soil gas survey will aid in assessing the presence f any subsurface volatile organic compound (VOC) contamination from degreasing activities which may have been conducted in the electroplating shop. The survey will be conducted on a 20-foot spaced grid pattern inside the electroplating shop and on a 20-foot spacing surrounding the electroplating room (inside and outside of Building 32).

Additional soil gas points will be completed around the grid points as appropriate and necessary to locate sources or extent of any detected soil gas VOC contamination. In addition, the results of the site geophysical surveys will be reviewed prior to completing the soil gas survey to assess the need to modify the planned soil gas survey (e.g., utilities, septic tank).

As described in the project Field Sampling Methodology discussion provided in Work Plan Appendix B, soil gas samples will be analyzed in the field with an organic vapor analyzer for total volatile organics and an HNu-311 portable gas chromatograph (GC) or equivalent. The portable GC will be used to identify the individual concentrations of several aromatic and chlorinated volatile organic compounds.

3.5 RESIDUE SAMPLING

Residue samples will be collected from floor drain trenches, metal vats, and plating pits inside of the electroplating room. The samples will include residues (aqueous or solid) present at each of the locations. Samples will be collected from eleven (11) locations within the electroplating room. The planned sample locations are shown on Figure 7. The rationale for the residue sample locations is provided in Table 5.

Samples will be collected from the three drain trenches (T-1, T-2, and T-3), two floor drains (DS-1 and DS-2), four metal vats (V-1 through V-4), and two concrete pits (P-1 and P-2). The drain trench samples (T-1 to T-3) will be collected as composite samples from throughout the three separate drain trenches. The floor drain, metal vat, and concrete pit samples will be collected as discrete samples. The samples will be collected as liquid or solid samples, whichever matrix is present at the planned location. If insufficient material is present at a particular location to sample, a similar type of sample (e.g., drain, vat) will be collected from a nearby location. The small motor generator room will also be visually surveyed for the presence of any possible contamination. If signs of possible contamination (residues, staining) are observed in this room, samples will also be collected from this room after consulting with the RIDEM and EPA.

The building residue samples will be analyzed for the TCL volatile and semivolatile organic compounds, TAL metals, and cyanide. In addition, at least three of the solid residue samples will be analyzed for the full TCLP analyses. At a minimum, the TCLP samples will include a concrete pit sample, a vat sludge sample, and a drain or trench sediment sample, if present. These samples will be collected only if sufficient solid residue is present for TCLP analyses.

3.6 SOIL SAMPLING

Soil samples will be collected from sub-slab soil in the electroplating room and from the subsurface soil just outside of the southwestern corner of Building 32. Below is a discussion of the planned soil sampling activities.

3.6.1 Subsurface Soil Sampling

Soil samples will be collected from five (5) subslab test boring locations (B-1 through B-5) within the electroplating room and three (3) subslab test boring locations (B-6, B-7, and B-8) outside of the electroplating room. The planned test borings locations are shown on Figure 7. These locations were selected to assess conditions under the concrete floor slab of the electroplating shop and assess conditions in soil just outside of the plating shop near Building 32. The rationale for the test boring locations is provided in Table 6. Soil sample locations are planned across the room adjacent to steel vats, trenches, a pit, and floor drains to assess potential impacts from floor discharges or spills to sub-slab soils.

The planned test boring locations may be reassessed based upon any significant findings of the site geophysical and soil gas surveys. If these preliminary surveys indicate locations of drain lines or VOC contamination, test borings will be relocated to investigate such areas. Significant findings of the surveys will be reviewed with EPA and RIDEM prior to relocating any of the planned soil boring locations to further investigate such findings.

Soil samples will be collected continuously from the soil borings to a minimum depth equivalent to the elevation of the observed ground water table. Beyond the depth of the water table, split-spoon sampling will continue only if signs of possible contamination (e.g, odors, stains, sheen) are observed. Continuous soil sampling will resume until such signs are no longer evident. Given that the subsurface soil sampling will be accomplished with a portable tripod rig split spoon sampling device, the depth of the split spoon sampling may be limited by physical conditions encountered at the site (e.g., boulders, bedrock, depth to ground water).

The following two subsurface soil samples will be collected from each of the planned test boring locations: one from the surface interval just beneath the floor or concrete, and one from just above the depth of the water table. If signs of potential contamination (e.g., odors, stains, oil) are observed at a depth between the two planned sampling intervals, the second sample will instead be collected from the depth of greatest observed contamination (i.e., most stained or oily, highest OVA/HNu readings) beyond the surface interval. The soil samples will be analyzed for the full TCL/TAL analyses.

Geologic soil sample descriptions and other soil sample characteristics (e.g., stains, odors) and observations (e.g., OVA/HNu readings, depth to water) will be recorded in a field notebook. All split-spoon soil samples will be screened with an OVA and HNu in the field.

3.7 SEDIMENT AND BIOTA SAMPLING

Previous sampling of sediment and mussels in Narragansett Bay adjacent to the site showed elevated levels of heavy metals in sediments and mussels. Additional sediment and biota sampling will be performed under this investigation to further evaluate the presence of any contamination in the bay which may have resulted from the electroplating operations.

Sediment and mussels samples will be collected from ten (10) locations in the bay adjacent to Building 32 and two background sample locations. The near site samples will be collected from around the two discharge pipes leading from Building 32. The ends of the discharge pipes will be located with a metal pipe locator during the site geophysical surveys. The planned sediment and biota sampling locations are shown on Figure 7a. The rationale for the sediment and biota sample locations is provided in Table 7.

Both sediment and mussel samples will be analyzed for the full TCL/TAL parameters. In addition, the temperature, pH, conductivity, dissolved oxygen, alkalinity, salinity, and hardness of the surface water will be measured at each sample location. Sediment samples will also be submitted for a grain size distribution analysis and for total organic carbon analysis.

3.8 LAND SURVEY

Following completion of field sampling activities, the site will be surveyed by a State of Rhode Island registered surveyor. The building location along with the locations and layout of any drains and pipes will be surveyed. All exterior sample locations will also be surveyed for location and elevation. The building interior sample locations will be taped off relative to building features (e.g., walls, doors) during sampling and added to the final site survey map. Each sampling location will be referenced to the State of Rhode Island Grid Coordinate System. Elevations will be referenced to a United States Geological Survey benchmark and the mean low water level.

4.0 SITE-SPECIFIC HEALTH AND SAFETY SUMMARY

4.1 INTRODUCTION

The purpose of the site-specific health and safety plan is to summarize the site-specific health and safety information. The project Health and Safety Plan (HASP) is provided in Appendix C of the Work Plan. This summary describes the nature of wastes potentially present on the site, the site access and work zones, and the initial levels of personnel protection and monitoring planned for each site investigation activity. A list of emergency procedures, contacts, and a map of the route to the Newport Hospital is provided as Table 3 and Figures 8 and 8a, respectively.

4.2 NATURE OF WASTES

Historical site information indicates use of the following materials at the Gould Island Electroplating Shop: hydrochloric acid, sulfuric acid, nitric acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, and nickel sulfate.

The findings of previous site investigations indicate the presence of hazardous concentrations of lead (up to 7.8 ppm in TCLP leachate) and cadmium (up to 7,000 ppm in TCLP leachate) in plating solutions on-site. In addition, composite sampling of waste residues indicates the presence of low levels (approx. 20 ppb) of volatile organic compounds and moderate levels (TICs approx. 2.4 ppm)). No soil or ground water samples have previously been collected within or around the electroplating shop. However, sediment and mussel samples collected in Narragansett Bay adjacent to Building 32 indicated "slightly elevated concentrations of cyanide and copper in sediments and an elevated concentration of copper is present in mussels".

Chemical hazards including volatile organic compounds (VOCs), heavy metals, and cyanide may be present in site soil or wastes.

4.3 SITE ACCESS/WORK ZONES

The site is contained within Building No. 32 on Gould Island in Narragansett Bay. Physical access to the site is restricted by its physical location on the island. Access to this site is by boat from the NUWC pier located on the Newport Naval Base directly east of the island.

The exclusion zone will consist of the area inside of Building 32. Entrance to this building will be through a garage door located at the southern end of the building, just east of the electroplating room. Entrances into the building will be demarcated using safety cones and caution tape or barricades. The OSC or designee will be responsible for keeping unauthorized personnel outside of the exclusion zone boundaries.

In the event that site visitors or unauthorized personnel are present during sampling activities, the OSC or alternate shall ensure that they stay outside of the exclusion zone. All personnel allowed to enter the exclusion zone by the OSC shall follow safety procedures described in the project HASP and designated by the OSC.

A contamination reduction station, or decontamination area, shall be established adjacent to Building 32, just outside of the garage door entrance on the south side of the building. This area will consist of an area adequate in size to contain decontamination equipment. Personnel exiting the exclusion zone shall undergo appropriate decontamination, as required by the activity-specific procedures described in the HASP.

The support zone for this site will be an area adjacent to the decontamination area. The support zone will include a canopy covered area with a table and chairs. The area will provide temporary relief from adverse weather conditions and will store necessary field sampling and safety/emergency equipment (e.g., mobile phone, first aid kit, drinking water, HASP).

The Gould Island heavy equipment decontamination zone will be located in the field during the field investigation mobilization activities. This area will be used for decontaminating the portable tripod drilling rig equipment (e.g., rods, spoons). The collection of field-generated materials is described in the Investigation Derived Waste Plan provided in the Project Introduction and Background volume of the Work Plan. All field generated wastes will be temporarily staged just within Building 32 or another area on the island designated by the Navy.

4.4 PERSONNEL PROTECTION AND MONITORING

The interior of the building and all sampling locations will be surveyed with an OVA or HNu and LEL/O2 meter in Level B protection during the site ambient air survey prior to sampling. If the ambient air survey findings permitting, all interior building surveys and sampling will be conducted in Level C personnel protection (as defined in the project HASP). Given the historic use of the site for electroplating activities and the documented presence of hazardous materials in the electroplating room, all interior building sampling will be conducted in a minimum of Level D personnel protection. A list of anticipated initial levels of protection for the site-specific investigation activities is presented in Table 4.

During the field sampling activities, continuous monitoring of ambient air will be conducted with an OVA and HNu. During drilling activities, continuous ambient monitoring of combustible gases will also be conducted with an LEL/O2 meter. Air monitoring will also be performed during subslab sampling activities to assess the presence of any contamination at each boring.

5.0 REFERENCES

ENSR Consulting and Engineering, February 14, 1992, Waste Inventory and sampling Report for Buildings 32 and 35 (Inactive), Naval Underwater Systems Center (NUSC), Gould Island Annex, Newport, Rhode Island, prepared for the Northern Division, Naval Facilities Engineering Command under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program.

Envirodyne Engineers, Inc., March 1983, Final Initial Assessment Study of the Naval Education and Training Center, Newport, RI, prepared for the Navy Assessment and Control of Installation Pollutants (NACIP) Department.

Loureiro Engineering Associates, May 15, 1986, Confirmation Study Report on Hazardous Waste Sites at Naval Education and Training Center, Newport, RI, prepared for the Northern Division, Naval Facilities Engineering Command.

NUS Corporation, October 4, 1991, Final Target Memo, DOD/NETC/Gould Island Electroplating, Middletown, Rhode Island, prepared for the RI Department of Environmental Management, Division of Air and Hazardous Materials under TDD No. F1-9012-02.

U.S. Navy, January 12, 1943, Memorandum, Re: Contract NOy-8167 - Report on Methods of Increasing the Fresh Water Supply, Gould Island.

U.S. Navy, August 21, 1959, Newport Area of Public Works Data Book, Bureau of Yards and Docks.

- TABLES -

Study Area 17 - Gould Island Electroplating Shop

TABLE 1

STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP SITE INVESTIGATION SUMMARY

<u>RECONNAISSANCE SURVEYS:</u>

Reconnaissance, ambient air, and radiological surveys on-site and in vats, pits and floor penetrations.

<u>GEOPHYSICAL SURVEYS:</u>

Electromagnetic conductivity and ground penetrating radar surveys on 10-foot spaced traverses inside the shop and outside Building 32.

<u>SOIL GAS SURVEY:</u>

A soil gas survey will be conducted on an approximately 20-foot grid inside the shop and outside Building 32.

<u>RESIDUE SAMPLING:</u>

Eleven (11) residue samples will be collected from floor drain trenches, metal vats, and plating pits inside the electroplating room. Residue samples will be analyzed for TCL volatile and semi-volatile organic compounds, TAL metals, and cyanide. At least three solid residue samples will be analyzed for TCLP parameters.

<u>SOIL SAMPLING:</u>

Subsurface Soil/Test Borings:

Soil samples will be collected from five (5) subslab test borings inside the electroplating room and three (3) locations outside Building 32. Two (2) samples per boring will be analyzed for the full TCL/TAL.

<u>SEDIMENT AND BIOTA SAMPLING:</u>

Sediment and Mussels:

Sediment and mussel samples will be collected from ten (10) locations within Narragansett Bay. These samples will be analyzed for full TCL/TAL parameters. Sediment samples will be submitted for grain size analysis and total organic carbon analysis.

<u>LAND SURVEY:</u>

A professional land survey will be conducted of site features and sampling points.

TABLE 2

STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP
PREVIOUS INVESTIGATION SAMPLE SUMMARY

Sample ID	Location	Waste Form and Estimated Quantity
T-16	Tank	Water, 5 Gallons
T-17	Tank	Water, 10 Gallons
T-24	Tank	Water, 10 Gallons
T-25	Tank	Liquid/Water, 5 Gallons
T-26	Vat	Acids, 2 Gallons
T-27	Tank	Liquid, 2 Gallons
T-28	Tank	Solid/Liquid, 5 Gallons (not analyzed)
T-29	Tank	Liquid/Water, 75 Gallons
T-30	Manhole	Liquid, ? Gallons

Total Volume - at least 114 Gallons

TABLE 3

STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP
SITE EMERGENCY CONTACTS

NUSC Emergency Numbers:

Command Duty Officer	*841-3124*
Security Office - Police	*841-4296*
NUSC Fire Protection	*841-3333*
U.S. Coast Guard	*846-3675*

Utilities:

Rhode Island Dig Safe	*800-225-4977*
NETC Dig Safe	*841-2464*

Newport Emergency Numbers:

Portsmouth Police Dept.	*683-0300*
Portsmouth Fire Dept.	*683-1200*
Newport Hospital	
General Number	*846-6400*
Emergency Room	*846-6400 ext. 1120*
Poison Control Center	*277-5727*

Additional Resources:

Dr. Erdil, or Dr. Stahl - TRC Company Physicians - Immediate Medical Care, Hartford, Connecticut - (203) 296-8330
Mr. James Peronto - TRC Project Manager - (203) 289-8631
Ms. Rachel Marino - NETC Environmental Coord. - (401) 841-3735
Mr. Robert Hanley - NETC Safety Officer - (401) 841-2478

TRC

TABLE 4

STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP
PERSONNEL PROTECTION SUMMARY

Activity	*Level of Protection*
Reconnaissance Survey	*B*
Geophysical Survey	*C*
Residue Sampling	*C*
Soil Gas Survey	*C*
Soil Borings	*C*
Sediment/Biota Sampling	*Mod. D*

NOTE: *The above list of personnel protection levels will be up or downgraded as conditions warrant according to criteria outlined in the project Health and Safety Plan (HASP).*

TRC

TABLE 5

Study Area 17 - Gould Island Electroplating Shop
Residue Sample Location Rationale

SAMPLE NUMBER	LOCATION / RATIONALE
T-1	Determine the presence of contamination in the floor drain trench.
T-2	Determine the presence of contamination in the floor drain trench.
T-3	Determine the presence of contamination in the floor drain trench.
DS-1	Determine the presence of contamination in the room floor drains.
DS-2	Determine the presence of contamination in the room floor drains.
V-1	Determine the presence of contamination in the metal vats.
V-2	Determine the presence of contamination in the metal vats.
V-3	Determine the presence of contamination in the metal vats.
V-4	Determine the presence of contamination in the metal vats.
P-1	Determine the presence of contamination in the concrete pits.
P-2	Determine the presence of contamination in the concrete pits.

TABLE 6

Study Area 17 - Gould Island Electroplating Shop
Test Boring Location Rationale

TEST BORING NUMBER	LOCATION / RATIONALE
B-1	Determine subsurface soil quality beneath the room floor and near the concrete pits.
B-2	Determine subsurface soil quality beneath the room floor.
B-3	Determine subsurface soil quality beneath the room floor.
B-4	Determine subsurface soil quality beneath the room floor.
B-5	Determine subsurface soil quality beneath the room floor.
B-6	Determine subsurface soil quality beneath the buildings floor just east of the electroplating room.
B-7	Determine subsurface soil quality just south of the building.
B-8	Determine subsurface soil quality just west of the building.

TRC

TABLE 7

Study Area 17 - Gould Island Electroplating Shop
Surface Water/Biota Sample Location Rationale

LOCATION NUMBER	LOCATION / RATIONALE
SD-1/BT-1	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-2/BT-2	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-3/BT-3	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-4/BT-4	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-5/BT-5	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-6/BT-6	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-7/BT-7	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-8/BT-8	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-9/BT-9	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-10/BT-10	Determine the sediment and biota quality in the bay near the outfalls from Building 32.
SD-11/BT-11	Determine site-specific background sediment and biota quality. Locations will be selected prior to sampling in consultation with RIDEM and EPA.
SD-12/BT-12	Determine site-specific background sediment and biota quality. Locations will be selected prior to sampling in consultation with RIDEM and EPA.

- FIGURES -

Study Area 17 - Gould Island Electroplating Shop

TRC

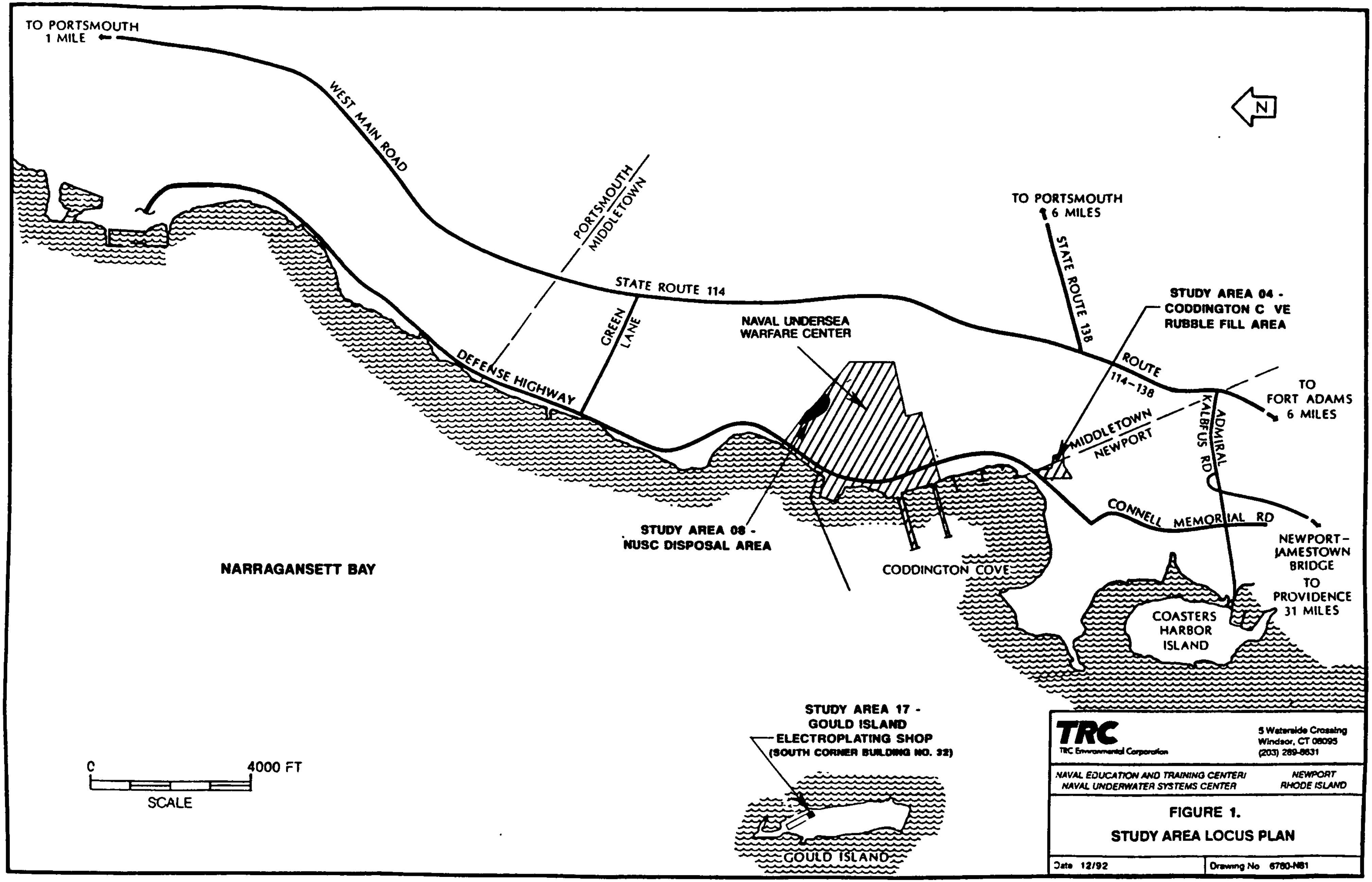
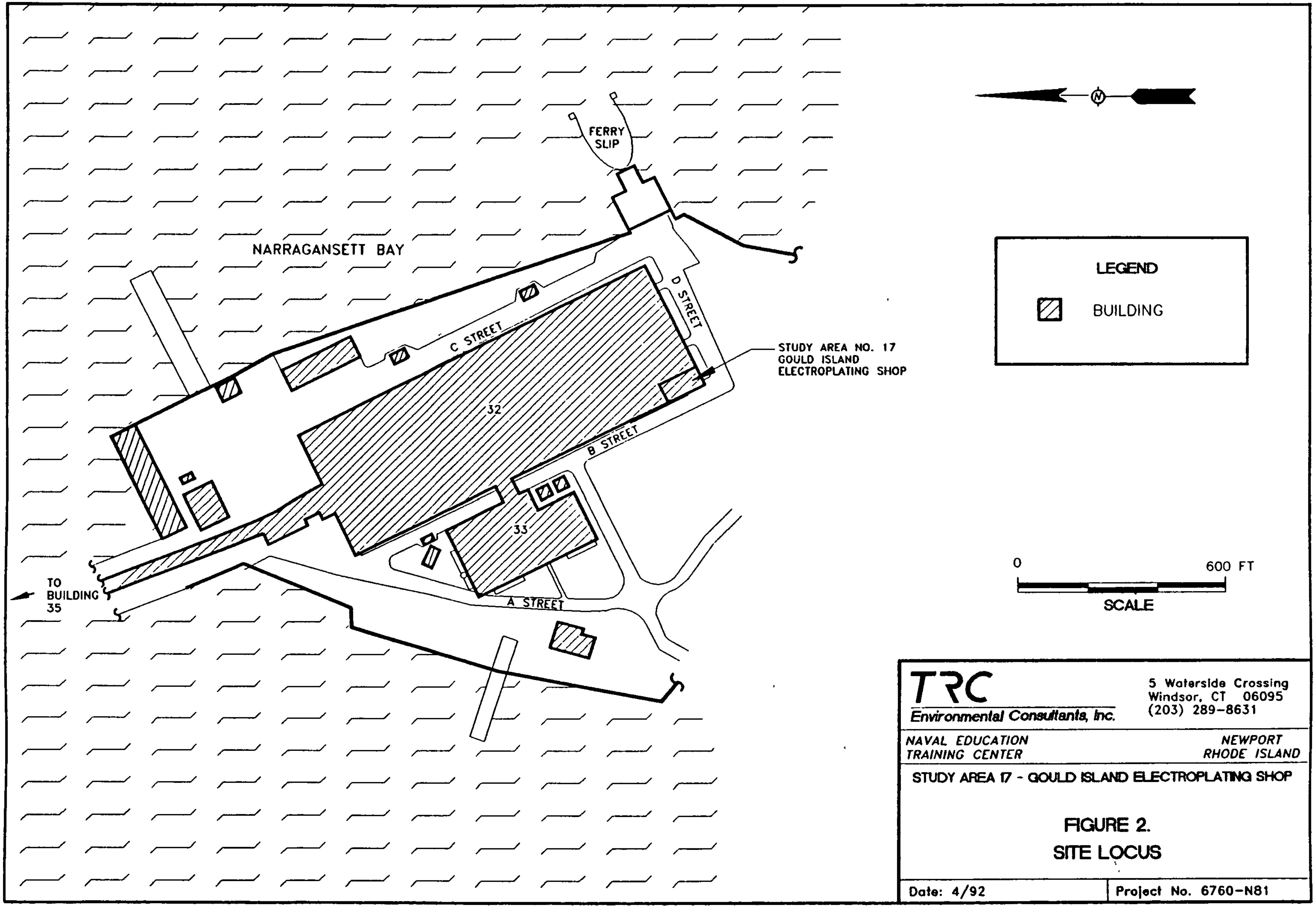
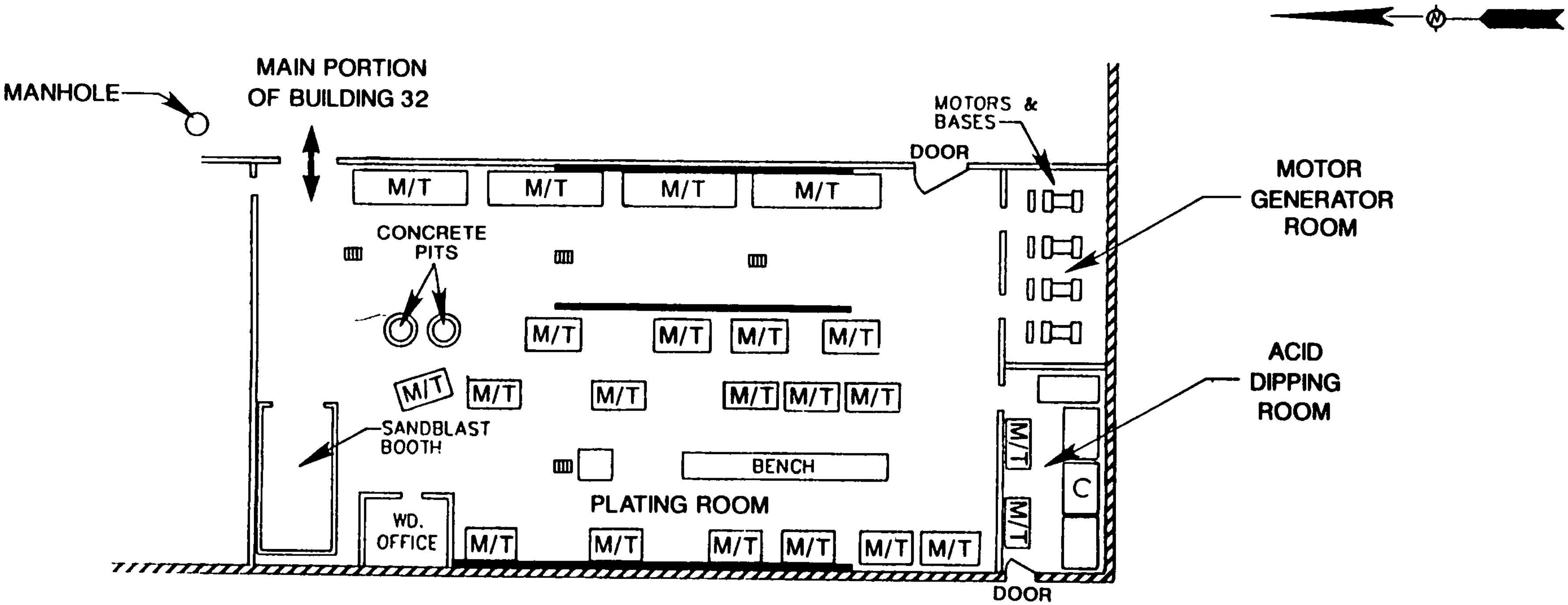


FIGURE 1.
STUDY AREA LOCUS PLAN



STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP

FIGURE 2.
SITE LOCUS



LEGEND

OUTSIDE BUILDING WALL

DRAIN

TRENCH

0 30 FT
SCALE

NOTE: BASE DRAWING FROM PLATE 1,
GOULD ISLAND, BUILDING 32, ENSR
CONSULTING & ENGINEERING, 10/30/91

TRC
Environmental Consultants, Inc.

5 Waterside Crossing
Windsor, CT 06095
(203) 289-8631

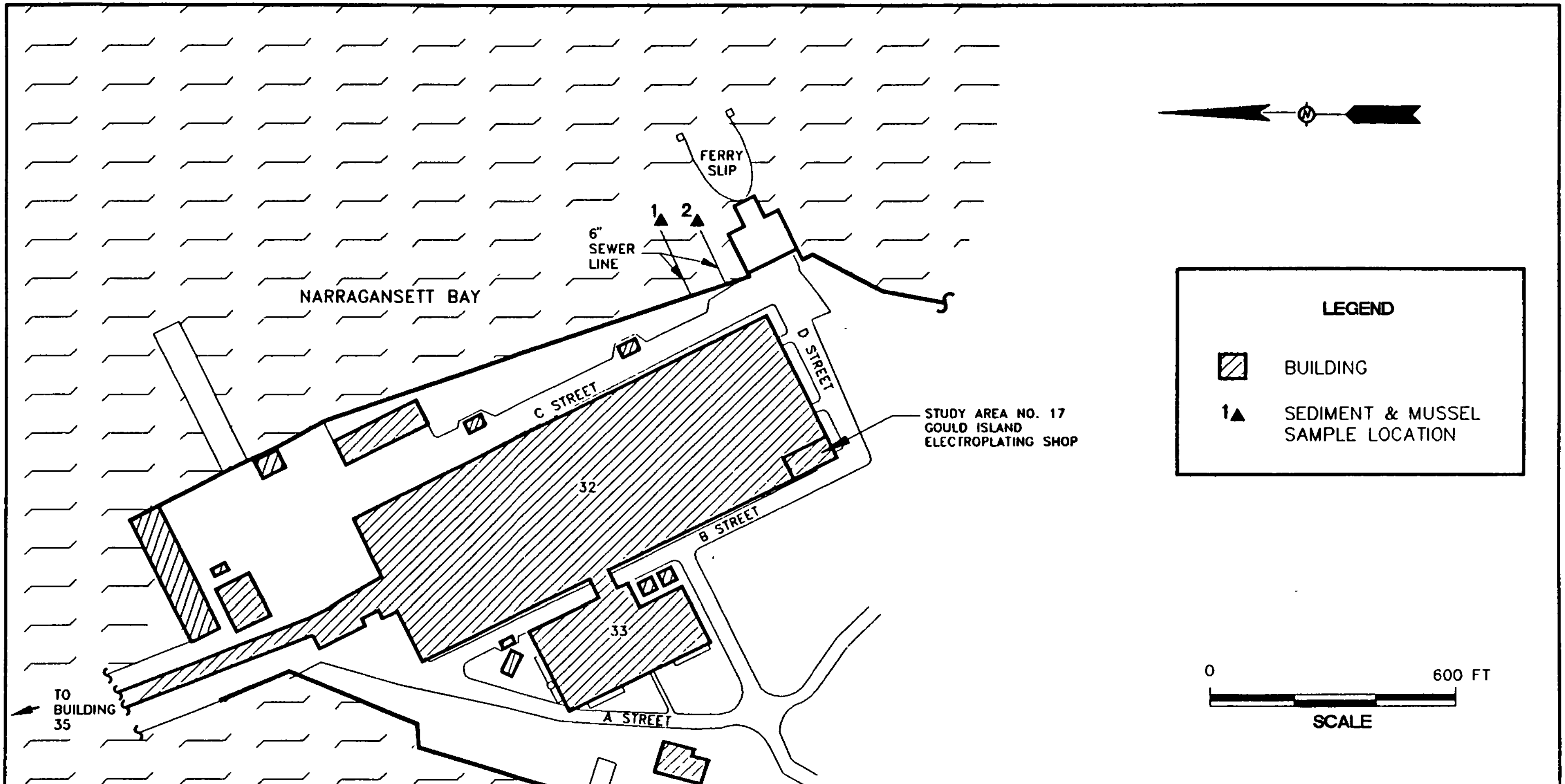
NAVAL EDUCATION TRAINING CENTER — NEWPORT RHODE ISLAND

STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP

FIGURE 3.

ELECTROPLATING SHOP PLAN

Date: 4/92 | Project No. 6760-N81



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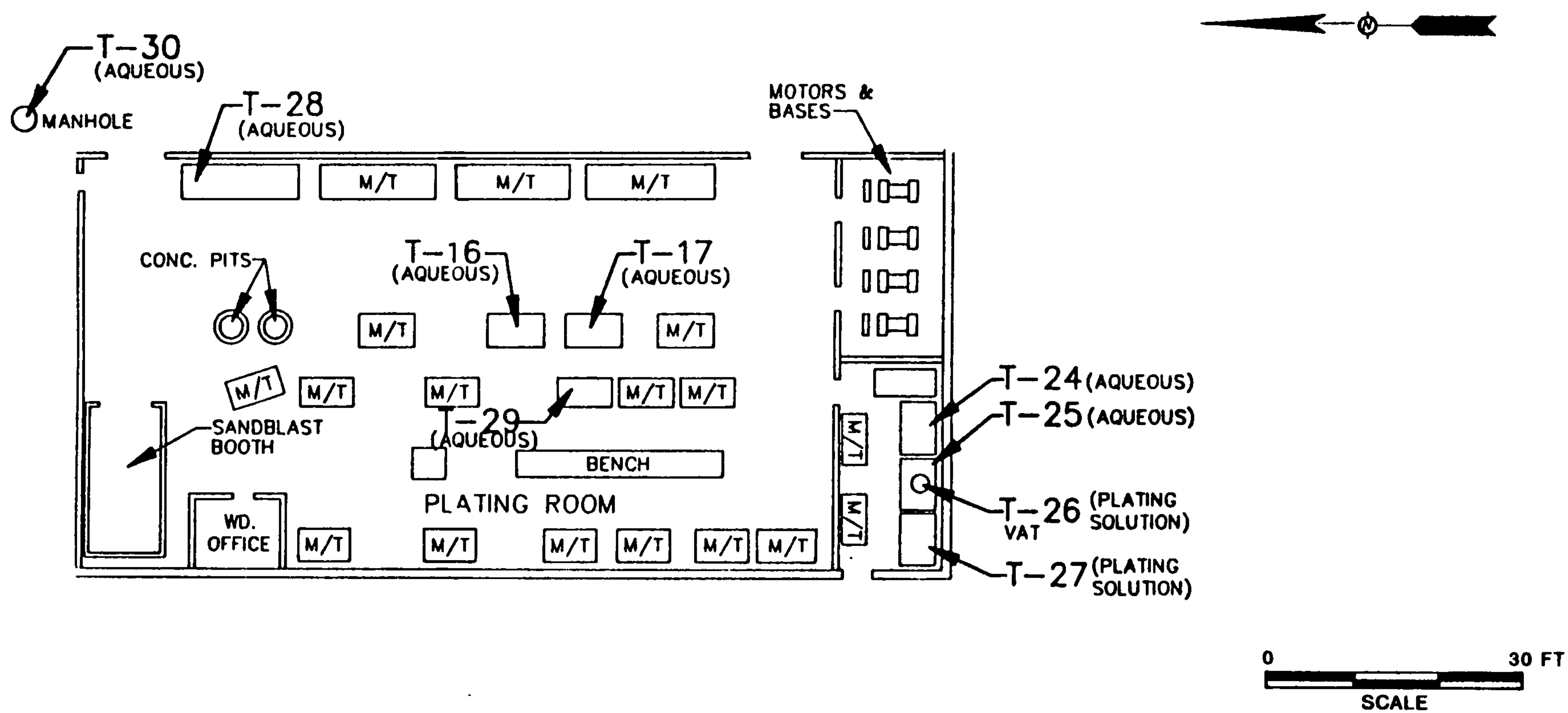
STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP

FIGURE 4.

CONFIRMATION STUDY SAMPLE LOCATIONS

Date: 4/92 | Project No. 6760-N81



NOTE: BASE DRAWING FROM PLATE 1, GOULD ISLAND, BUILDING 32, ENSR CONSULTING & ENGINEERING, 10/30/91

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FIGURE 5.

WASTE INVENTORY SAMPLE LOCATIONS

Date: 4/92 | Project No. 6760-N81

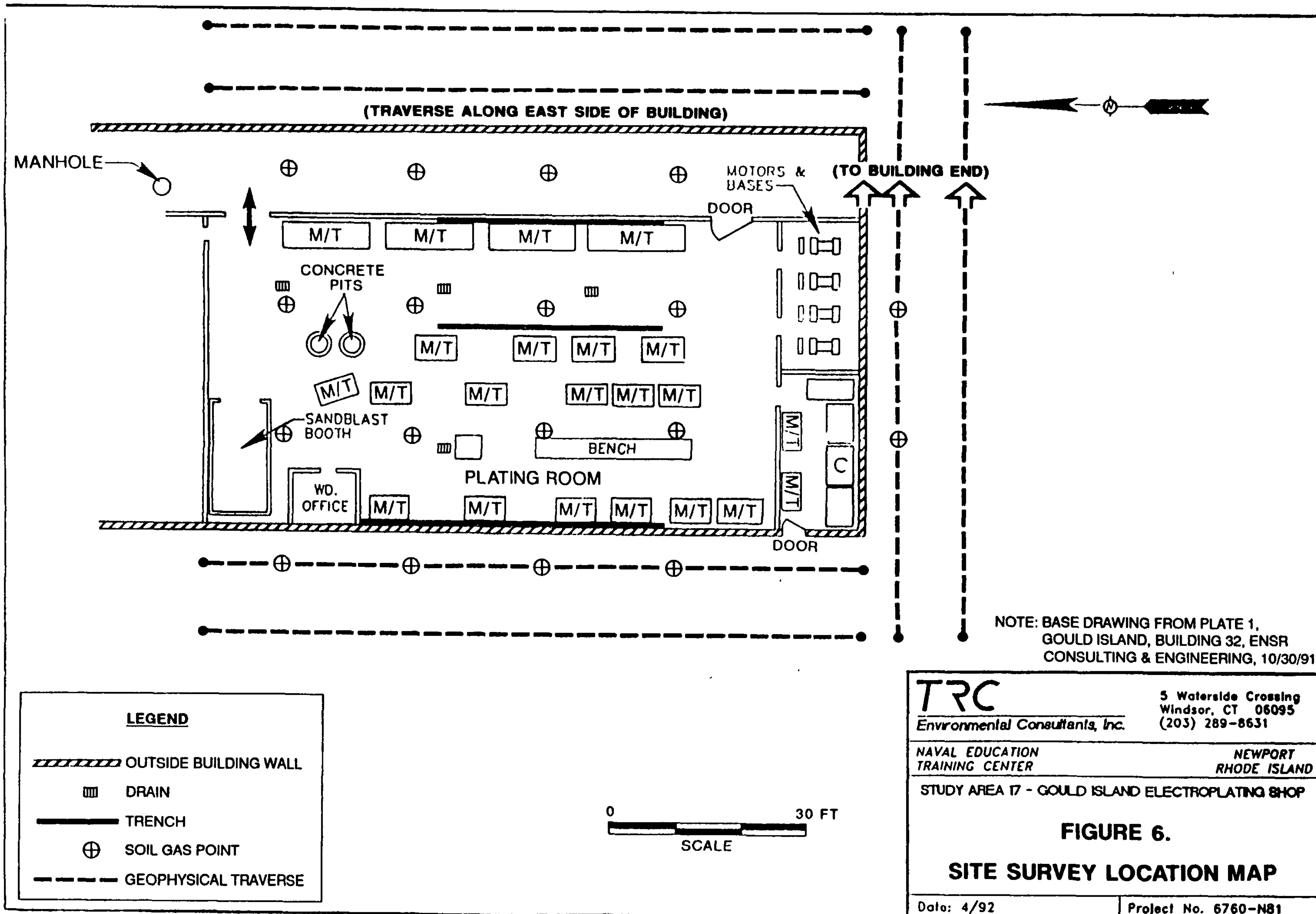
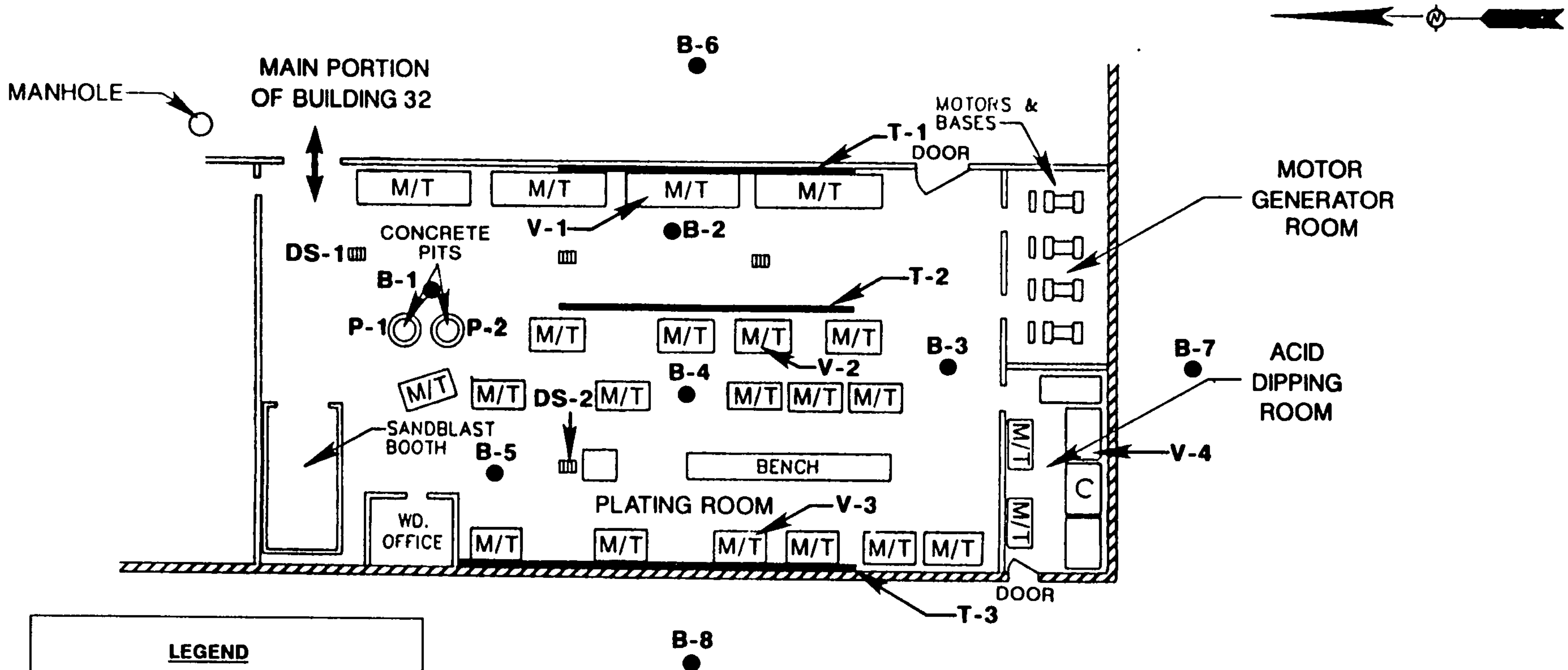


FIGURE 6.

SITE SURVEY LOCATION MAP



LEGEND

(hatched line)	OUTSIDE BUILDING WALL
(symbol)	DRAIN
(heavy line)	TRENCH
B-1	TEST BORING LOCATION
T-1	TRENCH RESIDUE SAMPLE
P-1	PIT RESIDUE SAMPLE
DS-1	DRAIN SEDIMENT SAMPLE

NOTE: BASE DRAWING FROM PLATE 1, GOULD ISLAND, BUILDING 32, ENSR CONSULTING & ENGINEERING, 10/30/91

0 30 FT
SCALE

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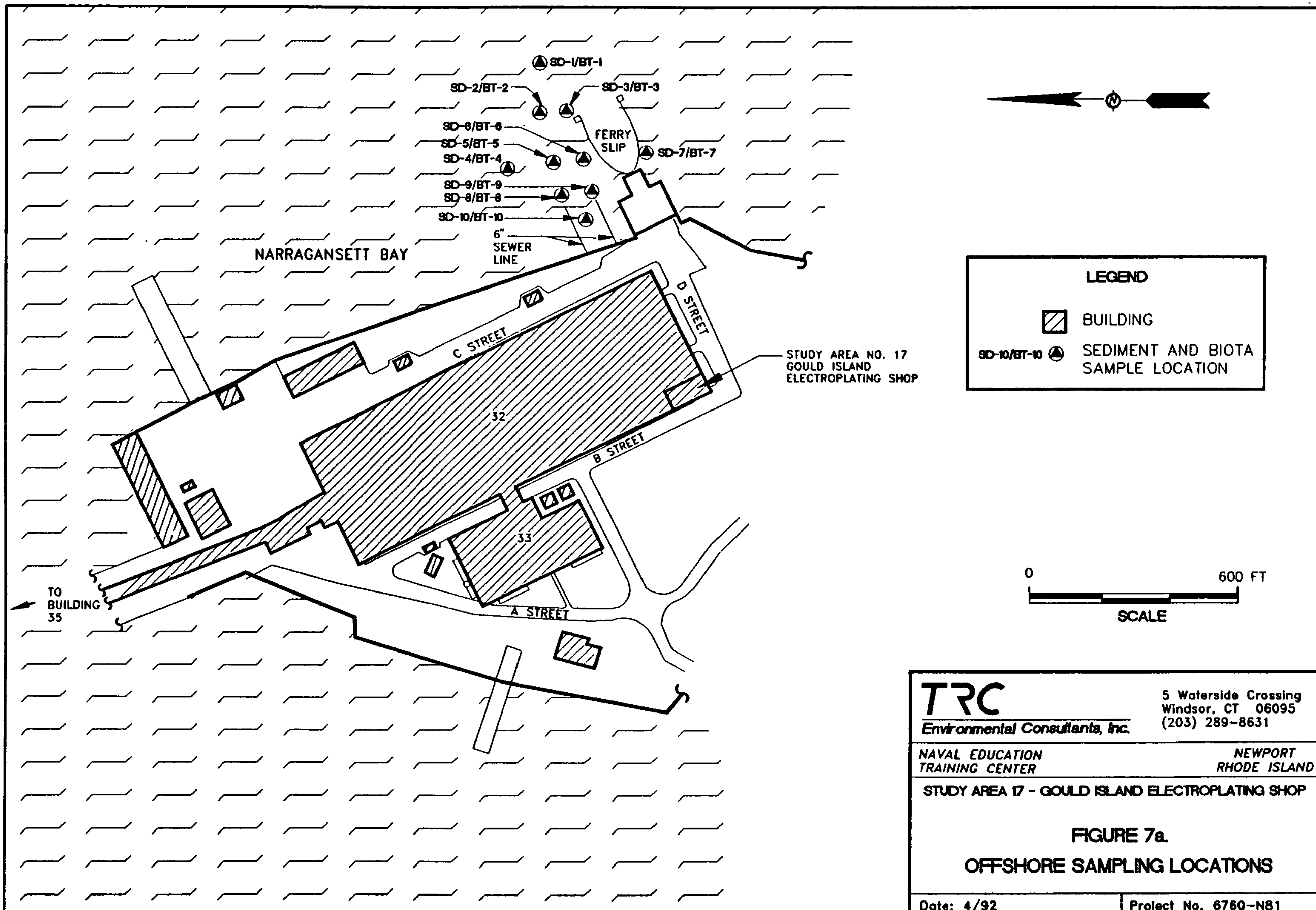
STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP

FIGURE 7.

SITE INVESTIGATION SUMMARY MAP

Date: 4/92 | Project No. 6760-N81



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STUDY AREA 17 - GOULD ISLAND ELECTROPLATING SHOP

FIGURE 7a.

OFFSHORE SAMPLING LOCATIONS

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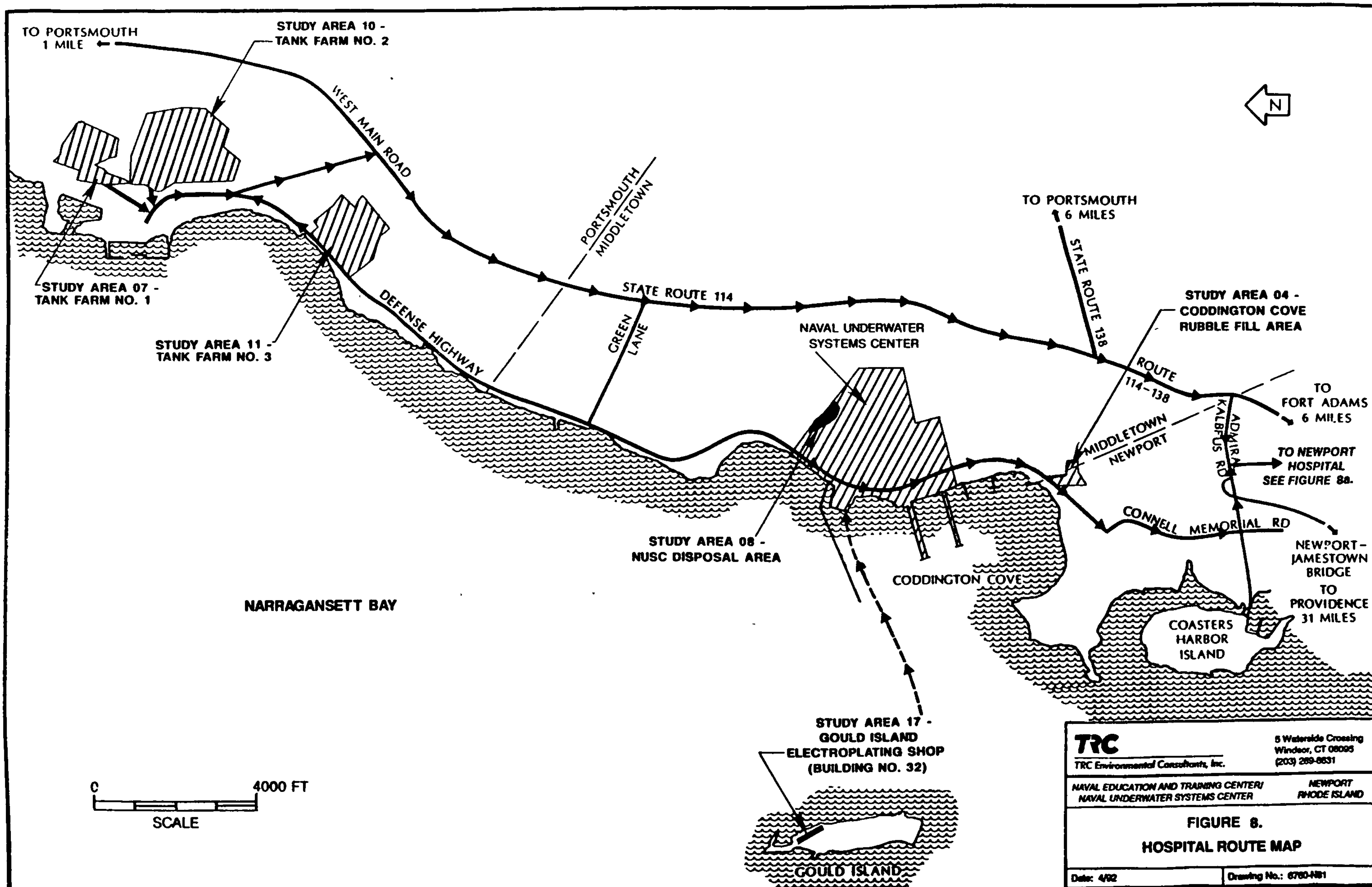
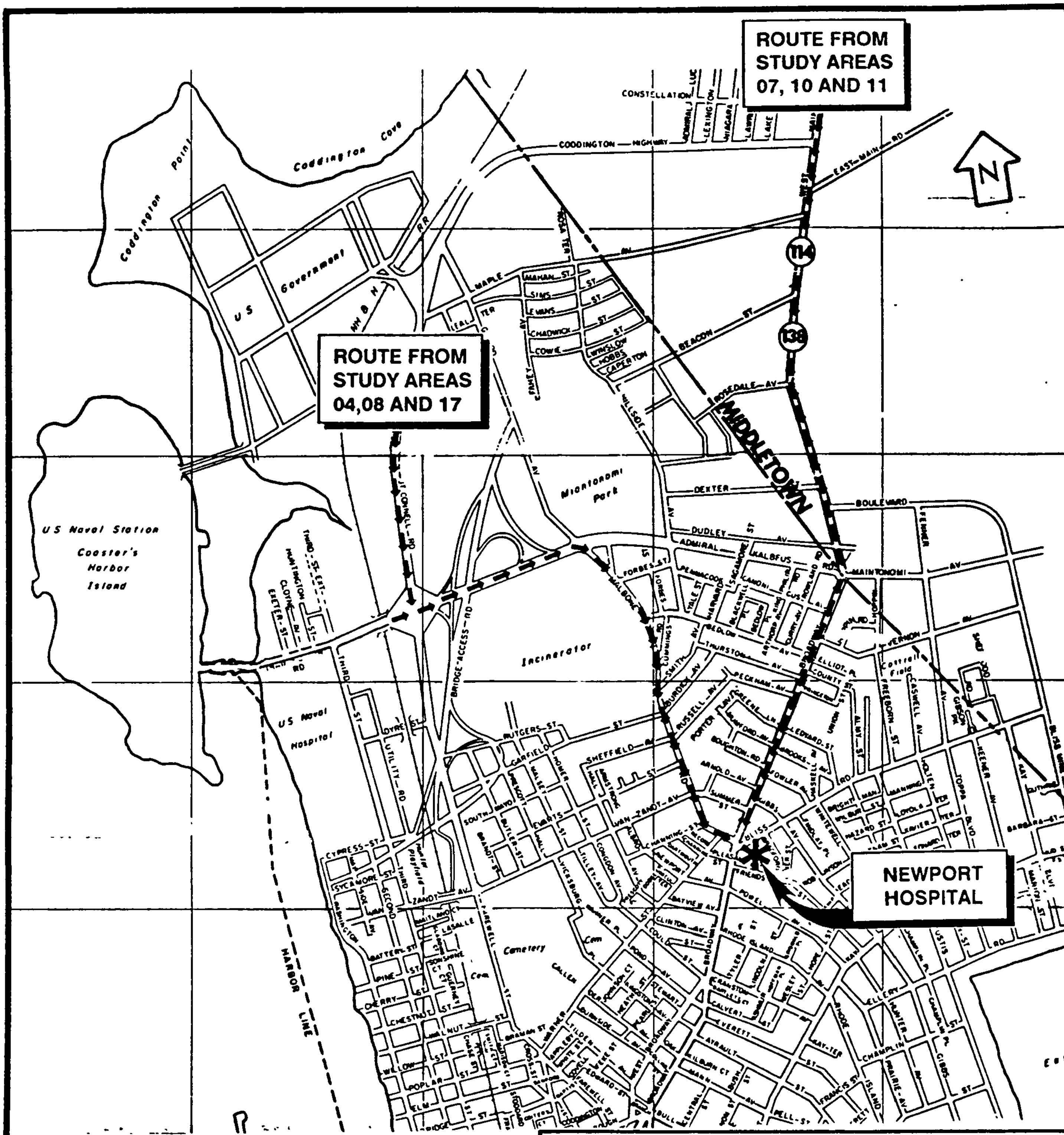


FIGURE 8.
HOSPITAL ROUTE MAP



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RHODE ISLAND

FIGURE 8a.

NEWPORT HOSPITAL ROUTE MAP

Date: 4/92 | Drawing No.: 6760-N81

APPENDIX A
BACKGROUND INFORMATION

Study Area 17 - Gould Island Electroplating Shop

- *U.S. Navy Existing Conditions Map*
- *Confirmation Study Tables 46 and 48*
- *Waste Sampling Plan Table 3-2*
- *Gould Island Well Locations Map*

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APPENDIX A-1

U.S. Navy Existing Conditions Map

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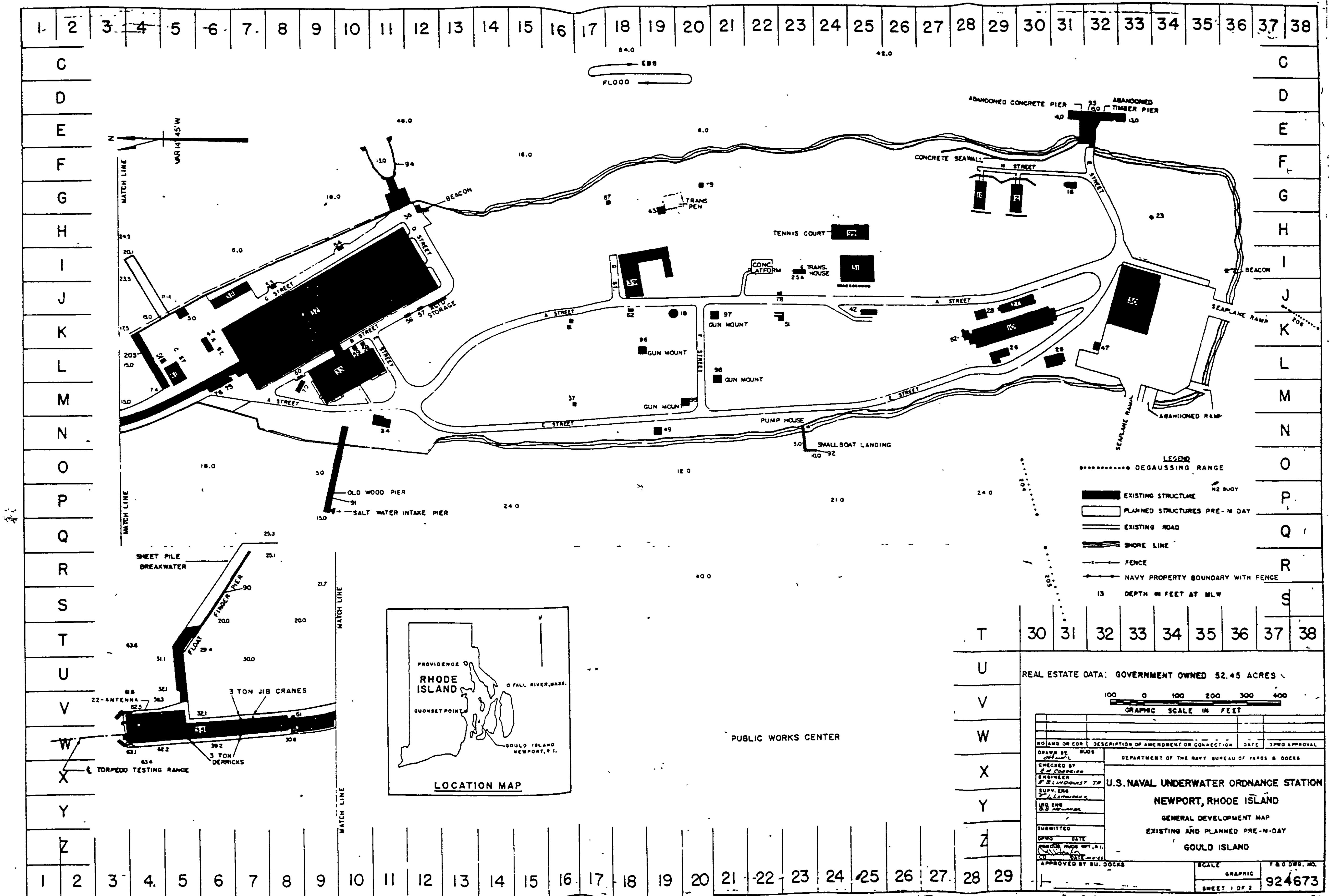
ABANDONED CONCRETE PIER
ABANDONED TIMBER PIER
CONCRETE SEAWALL
H STREET
E STREET
BEACON
TENNIS COURT
CONC PLATFORM
TRANS. HOUSE
TRANS PEN
A STREET
B STREET
C STREET
D STREET
F STREET
G STREET
AUTO STORAGE
GUN MOUNT
PUMP HOUSE
SMALL BOAT LANDING
SEAPLANE RAMP
ABANDONED RAMP
OLD WOOD PIER
SALT WATER INTAKE PIER
SHEET PILE BREAKWATER
FINGER PIER
FLOAT
3 TON JIB CRANES
3 TON DERRICKS
22-ANTENNA
TORPEDO TESTING RANGE
MATCH LINE
EBB
FLOOD
LEGEND
DEGAUSSING RANGE
EXISTING STRUCTURE
PLANNED STRUCTURES PRE-M DAY
EXISTING ROAD
SHORE LINE
FENCE
NAVY PROPERTY BOUNDARY WITH FENCE
13 DEPTH IN FEET AT MLW
LOCATION MAP
PROVIDENCE
RHODE ISLAND
FALL RIVER, MASS.
QUONSET POINT
GOULD ISLAND NEWPORT, R.I.
PUBLIC WORKS CENTER
REAL ESTATE DATA: GOVERNMENT OWNED 52.45 ACRES
100 0 100 200 300 400
GRAPHIC SCALE IN FEET
NO | AMD OR COR | DESCRIPTION OF AMENDMENT OR CORRECTION | DATE | DPWO APPROVAL
DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS
U.S. NAVAL UNDERWATER ORDNANCE STATION
NEWPORT, RHODE ISLAND
GENERAL DEVELOPMENT MAP
EXISTING AND PLANNED PRE-M-DAY
GOULD ISLAND
DRAWN BY
CHECKED BY
ENGINEER
SUPV. ENG
SUBMITTED
APPROVED BY BU. DOCKS
SCALE GRAPHIC
SHEET 1 OF 2
Y & D DWG. NO. 924673

APPENDICES

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

APPENDIX A
REGULATORY INFORMATION

STUDY AREA SCREENING EVALUATION
WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER,
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

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TRC Environmental Corporation

TRC-EC Project No. 6760-N81-100
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APPENDIX A
REGULATORY INFORMATION

Introduction and Project Background

- *RIDEM Ground Water Regulations*
- *RIDEM Surface Water Quality Regulations*

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APPENDIX A-1

Rhode Island DEM
Ground Water Quality Regulations

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STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Division of Groundwater and Individual Sewage Disposal Systems

Rules and Regulations for GROUNDWATER QUALITY

May 1992

Regulation DEM-GW-01-92, May 92

AUTHORITY: These regulations are adopted in accordance with Chapter 42-35 pursuant to Chapters 46-12, 46-13.1, 23-18.9, 23-19.1, 42-17.6 and 42-17.1 of the Rhode Island General Laws of 1956, as amended.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

RULES AND REGULATIONS FOR GROUNDWATER QUALITY

TABLE OF CONTENTS

TABLE OF CONTEN
(Continued)

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

RULES AND REGULATIONS FOR GROUNDWATER QUALITY

Section 1. PURPOSE

It is the purpose of these regulations to protect and restore the quality of the state's groundwater resources for use as drinking water and other beneficial uses, and to assure protection of the public health and welfare and the environment.

Section 2. LEGAL AUTHORITY

These rules and regulations are promulgated pursuant to the requirements and provisions of Chapter 46-12, Water Pollution; Chapter 46-13.1, Groundwater Protection; Chapter 23-18.9, Refuse Disposal; Chapter 23-19.1, Hazardous Waste Management Act; Chapter 42-17.1, Environmental Management; Chapter 42-17.6, Administrative Penalties for Environmental Violations; in accordance with Chapter 42-35, Administrative Procedures, of the Rhode Island General Laws of 1956, as amended.

Section 3. LIBERAL APPLICATION

The terms and provisions of these rules and regulations shall be liberally construed to allow the Department to effectuate the purposes of state and federal laws, goals, and policies.

Section 4. SEVERABILITY

If any provision of these rules and regulations or the application thereof to any person or circumstances is held invalid by a court of competent jurisdiction, the remainder of the rules and regulations shall not be affected thereby. The invalidity of any section or sections or parts of any section or sections shall not affect the validity of the remainder of these rules and regulations.

Section 5. APPLICABILITY

5.01 These regulations apply to all of the groundwaters of the state.

5.02 Persons subject to these regulations may also be subject to other regulations of the Department and may also be subject to federal regulations. Obligations of facility owners and facility operators hereunder shall be joint and several.

5.03 These regulations shall be construed in harmony with other Department regulations and the regulations of federal agencies. Nothing in these regulations shall affect the Director's power and duty to issue or require any form of groundwater monitoring, groundwater remediation, enforcement action or other action pursuant to any other regulatory program administered or enforced by the Director.

5.05 Individual Sewage Disposal Systems

(a) These regulations apply to all individual sewage disposal systems designed to treat ten thousand (10,000) or more gallons per day. Such systems are subject to the Groundwater Quality Certification requirements of section 17.

(b) Individual sewage disposal systems that are designed to treat less than ten thousand (10,000) gallons per day, that are used solely for the disposal of sanitary sewage (as defined herein), and which are designed, installed and operating in compliance with the Department's Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems, December 1989, and amendments thereto, are exempt from these Rules and Regulations for Groundwater Quality.

5.06 Monitoring Wells: Permanent monitoring wells installed pursuant to these regulations shall be in compliance with the construction standards in Appendix I. A monitoring well is designated permanent if it exists for more than 120 days. The monitoring well abandonment procedures in Appendix I shall apply to all permanent and non-permanent monitoring wells and those piezometers where improper abandonment would result in a reasonable likelihood of groundwater pollution.

5.07 The Director may require any facility owner or operator subject to these regulations to provide any information deemed necessary in order to determine compliance with these regulati[illegible] Failure to disclose such information shall be cause for initiating appropriate enforcement action and shall constitute valid cause for denial of any Departmental approvals under these regulations or the suspension of any approval issued hereunder.

5.08 Nothing in these regulations shall affect the Director's power and duty to issue an immediate compliance order or take any other action pursuant to the General Laws of Rhode Island, 1956, as amended.

Section 6. FINDINGS

The legislative findings set forth in the Rhode Island Groundwater Protection Act of 1985, section 46-13.1-2 of the General Laws of Rhode Island, 1956, as amended and which are repeated below in section 6.01 and the additional findings of the Department set forth in section 6.02 are made a basis for these regulations.

6.01 Legislative Findings

(a) Water is vital to life and comprises an invaluable natural resource which is not to be abused by any segment of the state's population or its economy. It is the policy of the state to restore, enhance, and maintain the chemical, physical, and biological integrity of its waters, to protect public health, to safeguard fish and aquatic life and scenic a[illegible] ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water;

(b) The groundwaters of the state are a critical renewable resource which must be protected to insure the availability of safe and potable drinking water for present and future needs;

(c) It is a paramount policy of the state to protect the purity of present and future drinking water supplies by protecting aquifers, recharge areas, and watersheds;

(d) It is the policy of the state to restore and maintain the quality of groundwater to a quality consistent with its use for drinking water supplies and other designated beneficial uses without treatment as feasible. All groundwaters of the state shall be restored to the extent practicable to a quality consistent with this policy;

(e) It is the policy of the state not to permit the introduction of pollutants into the groundwaters of the state in concentrations which are known to be toxic, carcinogenic, mutagenic, or teratogenic. To the maximum extent practical, efforts shall be made to require the removal of those pollutants from discharges where such discharges are shown to have already occurred;

(f) Existing and potential sources of groundwater shall be maintained and protected. Where existing quality is inadequate to support certain uses, the quality shall be upgraded if feasible to protect the present and potential uses of the resource;

(g) The groundwaters of the state are to be protected for use as agricultural, industrial, and potable water supplies, and other reasonable uses, and as a supplement to surface waters for recreation, wildlife, fish and other aquatic life, agriculture, industry, and potable water supply;

(h) Discharges to groundwater which subsequently discharge into surface waters and which would cause a contravention of surface water quality or standards shall not be permitted;

(i) No degradation of the state's groundwaters shall be permitted unless the state chooses to allow lower water quality as a result of the essential, desirable and justifiable economic, commercial, industrial, or social development.

6.02 Administrative Findings

(a) Approximately 25% of the population of Rhode Island depends on groundwater for its drinking water supply, and approximately 27 million gallons of groundwater are used every day in Rhode Island.

(b) Approximately two-thirds of the cities and towns in Rhode Island depend on groundwater for all or a significant portion of their public and private drinking water supply needs.

(c) Three sole source aquifers have been designated in Rhode Island by the United States Environmental Protection Agency.

(d) The groundwater resources of the state with the highest potential yield are located in glacial deposits of stratified drift which underlie about one-third of the state. These groundwater resources are vulnerable to pollution due to the relatively high water table, high permeability, and the absence of a confining subsurface layer that would inhibit movement of pollutants to groundwater.

(e) Most private drinking water supplies and many small public water supply systems [illegible] water from fractured bedrock aquifers. Groundwater pollution in bedrock is extremely difficult to monitor and remediate.

(f) Groundwater pollution continues to threaten public and private drinking water supplies. A significant number of public and private wells in Rhode Island have had pollutants in concentrations that have adversely impacted their use.

(g) Groundwater pollution must be prevented wherever possible because of the actual and potential adverse effects on public health and the environment and due to the technical difficulties and economic costs involved in groundwater remediation.

(h) Certain activities that represent a potential threat to groundwater quality are not appropriate in particular areas because of the sensitivity and value to the state of the underlying groundwater resource.

Section 7. DEFINITIONS

"Annular space seal" means the material placed above the top of the filter pack or the filter pack seal up to the ground surface seal and between the well casing and the adjacent formation.

"Aquifer" means a geologic formation, group of formations, or part of a formation that contains suffi saturated, permeable material to yield significant quantities of water to wells and springs.

"Bedrock" means solid rock, commonly called ledge, that forms the earth's crust, including fracture zones within said rock.

"Best management practices" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices designed to prevent or reduce the degradation of the state's groundwater to the maximum extent possible.

"Contaminant" means any physical, chemical, biological, or radiological substance or matter in water which impairs its intended or feasible use. For purposes of these regulations, contaminants shall include pollutants.

"Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

"Degradation" means a deterioration or decline in groundwater quality.

"Department" means the Rhode Island Department of Environmental Management or its successor.

"Director" means the director of the Rhode Island Department of Environmental Management or the Director's designee.

"Discharge to groundwater" means the intentional, negligent, accidental, or other release of any pollutant onto or beneath the land surface, in a location where it is likely to enter the groundwater of the state.

"Discharge zone" means a departmentally designated, three-dimensional zone within which the pollutant concentrations resulting from an active discharge to groundwater are allowed to be greater than the groundwater quality standards.

"Effluent" means liquid that is discharged from a facility.

"Emergency response" means any action undertaken immediately following the discovery of a release in order to completely or partially contain, clean up or treat the released material to prevent an immediate and/or substantial threat or risk of acute or chronic adverse effect on human health or to prevent an immediate and/or substantial significant adverse impact to the environment.

"Facility" means any parcel of real estate or a contiguous series or parcels of real estate together with any and all structures, facility components, improvements, fixtures and other appurtenances located therein which constitutes a distinct geographic unit.

"Filter Pack" means the sand, gravel, or both placed in direct contact with the well screen.

"Filter pack seal" means the sealing material placed in the annular space above the filter pack and below the annular space seal to prevent the migration of annular space sealant into the filter pack.

"Groundwater" means water found underground which completely fills the open spaces between particles of sediment and within rock formations.

"Groundwater quality classification" means the categorization of groundwater as usable for particular purposes on the basis of its physical, chemical, and hydrogeologic characteristics; also, the particular class (GAA, GA, GB, or GC) assigned to a particular volume of groundwater within specific geographic boundaries.

"Groundwater quality standards" means concentrations of specific chemical, biological, and radiological constituents and/or narrative statements which describe the quality of groundwater which shall be met in a particular groundwater quality classification.

"Groundwater recharge" means the process of adding water to the zone of saturation; or the quantity of water added to the zone of saturation.

"Groundwater reservoirs" means those stratified drift deposits having a saturated thickness greater than or equal to 40 feet and a transmissivity greater than or equal to 4000 feet squared per day which have been designated by the Director to be potentially significant sources of water.

"Hazardous material" means any material or combination or mixture of materials containing any hazardous substance in an amount and concentration such that when discharged to groundwater will or may reasonably be expected to cause acute or chronic adverse effects on human health or the environment. Hazardous material shall also include any material that contains a hazardous waste.

"Hazardous substance" means any substance designated as such pursuant to 40 CFR 300.5.

"**Hazardous waste**" means hazardous waste as defined in the Rhode Island Department of Environmental Management Rules and Regulations for Hazardous Waste Generation, Transportation, Treatment, Storage and Disposal, 1988, and amendments thereto.

"**Hydraulic conductivity**" means a measure of the ability of an aquifer to transmit a fluid; it is expressed as the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

"**Individual sewage disposal system**" means any system of piping, tanks, disposal areas, alternative toilets or other facilities designed to function as a unit to convey, store, treat and/or dispose of sanitary sewage by means other than discharge into a public sewer system.

"**Licensed solid waste landfill**" means any solid waste disposal facility consisting in whole or in part of a landfill, which facility is operating pursuant to a valid department license issued pursuant to a final action of the Director as to which all applicable appeals periods have expired.

"**Monitoring well**" means a well that is specifically located, designed, constructed, and emplaced to sample groundwater quality; the monitoring well may also be used to measure water table elevations.

"**Monitoring well abandonment**" means to remove a monitoring well from service in such a manner that vertical movement of water within the well bore and within the annular space surrounding the well casing is effectively and permanently prevented.

"**Non-attainment**" means groundwater, designated by the Director, that has pollutant concentrations greater than the groundwater quality standards for the classification.

"**Operator**" means any person or persons having control or having legal responsibility for operating or maintaining any facility which is subject to these regulations.

"**Owner**" means any person who holds exclusive or joint title to, or lawful possession of real or personal property which is subject to these regulations.

"**Person**" means an individual, trust, firm, joint stock company, corporation (including a quasi-governmental corporation), partnership, association, syndicate, municipality, municipal or state agency, fire district, club, non-profit agency, or any subdivision, commission, department, bureau, agency or department of state or federal government (including quasi-governmental corporation), or any interstate or international body, or any agent or employee thereof.

"**Piezometer**" means a well with a short screen that allows measurement of the water level at a particular depth in the aquifer.

"**Point of compliance**" means any location, described by depth and/or distance from a facility, at which the groundwater quality is sampled to determine whether a preventive action limit or groundwater quality standard is met as a result of activities occurring at such facility.

"**Pollutant**" means any material or effluent which may alter the chemical, physical, biological, or radiological characteristics and/or integrity of water, including but not limited to, dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, cellar dirt or industrial, municipal, agricultural, or other waste or material, petroleum or petroleum products, including but not limited to oil.

"Pollution" means the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water.

"Preventive action limit" means a specified percentage of a numerical groundwater quality standard.

"Private well" means a well established for the purpose of meeting all or part of a person's potable water needs provided said well does not supply a public water system.

"Public water system" means a system for the provision to the public of piped water for human consumption, provided such a system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year; and shall include all sources and facilities involved in collecting, treating, storing, and distributing the water.

"Public well" means a well that serves a public water system.

"Recharge area" means the land surface from which water is added to the zone of saturation. The recharge area for a particular well or aquifer, for instance, is that land surface from which water moves to the well or aquifer or may move to the well or aquifer under certain hydraulic conditions.

"Release" means any spilling, leaking, pumping, pouring, emitting, emptying, injecting, escaping, leaching, dumping, or disposing of any pollutant onto or below the land surface. For purposes of these regulations, release also includes any storage, disposal, or abandonment of any substance or material in a manner which presents a substantial threat of release as herein defined.

"Remediation" means prevention and control of pollutant migration to, within, or from the groundwater and/or the removal of a pollutant from the groundwater.

"Residual zone" means a departmentally designated, three-dimensional zone within which the pollutant concentrations remaining in the groundwater after remediation activities are allowed to be greater than the groundwater quality standards.

"Sanitary sewage" means wastewater associated with human hygiene, routine cleaning and janitorial activities that is discharged from sanitary conveniences (e.g., toilets, sinks, tubs, showers; dishwashers, kitchen sinks; and laundry machines).

"Saturated thickness" means the thickness of an aquifer measured from the water table to an essentially impermeable boundary; such boundary is typically taken to be the top of the bedrock surface.

"Saturated zone" means the subsurface zone in which all open spaces are filled with water.

"Sludge" means residue, whether partially solid or solid, treated or untreated, resulting from the treatment of sewage, including, without limitation, such residues from the cleaning of sewers, by processes, such as settling, flotation, filtration and centrifugation, and shall not meet the criteria for a hazardous waste as found in the Rhode Island Department of Environmental Management Rules and Regulations for Hazardous Waste Generation, Transportation, Treatment, Storage and Disposal, 1988, and amendments thereto.

"**Sole source aquifer**" means an aquifer designated by the United States Environmental Protection Agency as the sole or principal source of drinking water for the area above the aquifer and including those lands where the population served by the aquifer live; that is, an aquifer which is needed to supply 50% or more of the drinking water for that area and for which there are no reasonably available alternative sources should the aquifer become polluted.

"**Solid waste**" means solid waste as defined in the Rhode Island Department of Environmental Management Rules and Regulations for Solid Waste Management Facilities, February 1991, and amendments thereto; and which shall include garbage, refuse and other discarded solid materials generated by residential, institutional, commercial, industrial and agricultural sources but does not include solids or dissolved materials in domestic sewage or sewage sludge, nor does it include hazardous waste. Solid waste shall also include non-hazardous liquid, semi-solid, and containerized gaseous waste.

"**Static water table**" means the water table under natural, non-pumping conditions.

"**Stratified drift**" means predominantly sorted sediments deposited in layers by meltwater from a glacier.

"**Till**" means predominantly unsorted, unstratified sediments deposited directly by a glacier.

"**Transmissivity**" means a measure of the ability of an aquifer to transmit a fluid. It can be quantified as the hydraulic conductivity multiplied by the saturated thickness.

"**Unconsolidated deposits**" means naturally occurring materials in which the particles are loose or loosely cemented, e.g., sand, gravel.

"**Underground storage tank**" means any one or combination of tanks (including underground pipes connected thereto) which is used to contain an accumulation of petroleum product or hazardous material, and the volume of which (including the volume of the underground pipes connected thereto) is 10 percent or more beneath the surface of the ground.

"**Water table**" means the upper surface of the saturated zone in an unconfined aquifer.

"**Well**" means a bored, drilled, or driven shaft or a dug hole, with a depth that is greater than its largest surface dimension, through which groundwater flows, has flowed, or may flow under natural or induced pressure.

"**Wellhead protection area**" means a three-dimensional zone, designated by the Director, surrounding a public well or wellfield through which water will move toward and reach such well or wellfield.

<u>Section 8.</u> PROHIBITIONS

8.01 Groundwater shall be maintained at a quality consistent with its classification. No person shall take actions that violate or cause to violate the standards established in these regulations.

8.02 No person shall cause or allow a discharge of any pollutant to groundwater without the approval of the Director pursuant to these and other Department regulations.

8.03 No person shall take action that shall cause or allow groundwater designated non-attainment pursuant to section 9.02 to be further degraded.

8.04 No person shall operate or maintain a facility in a manner that is likely to result in a discharge of any pollutant to groundwater without the approval of the Director.

8.05 No person shall discharge hazardous materials to the groundwaters of the state.

8.06 Solid waste landfills and facilities for the disposal of hazardous waste are prohibited in areas where the groundwater is classified GAA.

8.07 No person shall install underground storage tanks in new locations within the wellhead protection area of community water supply wells. This prohibition shall not apply to the replacement or upgrading of existing underground storage tanks installed prior to the effective date of these regulations provided that such activity take place in accordance with all applicable state and federal regulations.

Section 9. GROUNDWATER CLASSIFICATION

9.01 Definitions: The Director shall classify the groundwater resources of Rhode Island using the four classes established in Chapter 46-13.1 of the General Laws of Rhode Island, 1956, as amended and which are further defined below:

(a) Groundwater classified GAA shall be those groundwater resources which the Director has designated to be suitable for public drinking water use without treatment and which are located within the following areas:

(1) Groundwater reservoirs and portions of their recharge areas as delineated by the Department, pursuant to the method described in Policies and Procedures for Mapping Recharge Areas to Groundwater Reservoirs for GAA Classification, Rhode Island Department of Environmental Management, March, 1990;

(2) A 2000 foot radius circle around each community water system well or within the delineation of a wellhead protection area to each well delineated by the Director or another delineation which is accepted by the Director in accordance with the Rhode Island Wellhead Protection Program, Rhode Island Department of Environmental Management, February 1990, and any amendments thereto; and

(3) Groundwater dependent areas, such as Block Island, that are physically isolated from reasonable alternative water supplies and where the existing groundwater supply warrants the highest level of protection.

(b) Groundwater classified GA shall be those groundwater resources which the Director has designated to be suitable for public or private drinking water use without treatment and which are not described in section 9.01(a)(1)-(3).

(c) Groundwater classified GB shall be those groundwater resources which the Director has designated not suitable for public or private drinking water use. Groundwater located beneath the following areas may be classified GB:

(1) Highly urbanized areas of the state with dense concentrations of industrial and commercial activity;

(2) The waste disposal area at sites of the following facilities:

(i) Inactive landfills and inactive land disposal sites for solid waste, hazardous waste, and sewage sludge;

(ii) Active sites for the land disposal of sewage sludge, unless such disposal site is associated with a licensed solid waste landfill;

(3) The area immediately surrounding the waste disposal area, which the Director has determined is not suitable for public or private drinking water use, at the following inactive and active facilities: landfills, land disposal sites for solid waste, hazardous waste, and sewage sludge.

(d) Groundwater may be classified GC in those areas which, because of present or past land use or hydrogeological conditions, the Director has determined to be more suitable for certain waste disposal practices.

(1) Groundwater located beneath the following areas may be classified GC:

(i) At licensed solid waste landfills:

(A) The currently permitted area for waste disposal as established valid operating license issued by the Department; and

(B) Areas surrounding the permitted area for waste disposal that the Director determines are potentially suitable for waste disposal based on the hydrogeologic environment, groundwater quality, groundwater use off-site, and surrounding surface water quality and use;

(ii) Areas that have been reclassified pursuant to section 11.08 for solid waste landfills and facilities for the disposal of hazardous waste.

(2) At the point in time when a license for a solid waste landfill or facility for the disposal of hazardous waste has lapsed or the facility is no longer being operated, then the Director shall conduct a site-specific evaluation to determine whether the GC classification is appropriate for the site.

9.02 Non-attainment Areas: Non-attainment areas are those areas that have pollutant concentrations greater than the groundwater quality standards for the applicable classification. The Director shall designate such groundwater as "non-attainment" in the following manner: GAA Non-attainment (GAA-NA), GA Non-attainment (GA-NA), or GB Non-attainment (GB-NA).

(a) The goal for non-attainment areas is restoration to the groundwater quality consistent with the standards in section 10 for the applicable class.

(b) The Director shall maintain maps of areas in which groundwater has been designated GAA-NA and GA-NA on file in the Department's Groundwater Section. Groundwater designated GAA-NA and GA-NA shall include, but shall not be limited to, groundwater not classified GB or GC that is located in areas associated with the following activities:

(1) Subsurface disposal of commercial and industrial effluent where the Director has reason to believe such areas are in non-attainment;

(2) Surface impoundments and uncontrolled surface disposal of commercial and industrial wastes where the Director has reason to believe such areas are in non-attainment;

(3) At inactive landfills and inactive land disposal sites for solid waste, hazardous waste, and sewage sludge:

(i) The entire site at those sites where data is not available for an adequate delineation of the waste disposal area;

(ii) At sites where the waste disposal area has been adequately delineated pursuant to section 9.01(c)(2): the area determined by the Director to be in non-attainment beyond the waste disposal area and beyond the area described in section 9.01(c)(3);

(4) At licensed solid waste landfills and active sites for the land disposal of sewage sludge: the area determined by the Director to be in non-attainment beyond that area described in Section 9.01(d)(1) and 9.01(c)(3);

(5) Road salt storage sites where road salt has not been stored in accordance with best management practices; and

(6) Releases of chemicals or petroleum products where significant volumes are known or presumed to have reached the groundwater.

9.03 Classification Boundary Disputes: In the event that the boundaries of the groundwater classification areas shown on groundwater classification maps produced by the Department are in dispute, the burden of proof shall be on the person disputing the boundary locations as shown on such map to show, pursuant to section 11 that the boundary locations are incorrect. In determining the accuracy of the Director's delineations, the regional hydrogeologic conditions beyond the boundaries of the specific site in question and the seasonal fluctuations in the water table shall be considered.

9.04 Classification Maps: The Director shall prepare and adopt, simultaneously with the adoption of these regulations, groundwater classification maps, which designate groundwater classification pursuant to these regulations. Said groundwater classification maps shall be at a scale of 1:24000, and such maps shall be on file for review at the Rhode Island Department of Environmental Management Groundwater Section, 291 Promenade Street, Providence, RI 02908. Smaller scale, statewide maps may be made available from the Department at the above address. The Director shall establish an appropriate fee for copies of the groundwater classification maps, which shall be based on the costs of map reproduction.

Section 10. GROUNDWATER QUALITY STANDARDS AND PREVENTIVE ACTION LIMITS

10.01 General: The Director shall establish groundwater quality standards and preventive action limits to be used in determining compliance with the groundwater classifications, including, but not limited to, compliance of proposed discharges to groundwater, existing discharges to groundwater, groundwater remediation activities, and other facilities and activities that have an actual or potential adverse impact on groundwater quality. Numerical groundwater quality standards and preventive action limits shall be established only for class GAA and class GA.

10.02 Class GAA and Class GA Groundwater Quality Standards and Preventive Action Limits

Class GAA and class GA groundwater are suitable for drinking water use without treatment, and therefore, both classes are subject to the same groundwater quality standards and preventive action limits, which are defined below. The preventive action limits shall be set at 50% of the numerical groundwater quality standards.

(a) Pollutants shall not be in groundwater classified GAA or GA, except within an approved discharge zone or residual zone (as provided for in sections 13.03 and 13.04 respectively), in any concentration which will adversely affect the groundwater as a source of potable water or which will adversely affect other beneficial uses of the groundwater, to include but not be limited to recreational, agricultural and industrial uses and the preservation of fish and wildlife habitat through the maintenance of surface water quality.

(b) The numerical groundwater quality standards and the preventive action limits for specific substances in class GAA and class GA are listed in Table 1.

(c) Groundwater classified GAA and GA shall be of a quality which the Director determines does not violate or have any reasonable potential to cause a violation of surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto.

10.03 Class GB and GC Groundwater Quality Standards

(a) Groundwater classified GB and GC shall be of a quality which the Director determines does not:

(1) Threaten public health and/or the environment;

(2) Violate or have a substantial likelihood to cause a violation of surrounding groundwater quality standards;

(3) Adversely impact or have a substantial likelihood to adversely impact:

(i) Current or proposed uses of the facility;

(ii) Current or proposed uses of groundwater and surface water at or within the facility boundaries;

TABLE 1. Numerical Groundwater Quality Standards and Preventive Action Limits for Class GAA and Class GA.

Substance	Groundwater Quality Standard	Preventive Action Limit
	(milligrams per liter, except as noted)	
A. Inorganic Chemicals		
Arsenic	0.05	0.025
Barium	1	0.5
Cadmium	0.01	0.005
Chromium (hexavalent)	0.05	0.025
Fluoride	4	2
Lead	0.05	0.025
Mercury	0.002	0.001
Nitrate (as N)	10	5
Selenium	0.01	0.005
Silver	0.05	0.025
B. Organic Chemicals		
Aldicarb (Temik)	0.003	0.0015
Aldicarb Sulfone	0.002	0.001
Aldicarb Sulfoxide	0.004	0.002
Endrin	0.0002	0.0001
Lindane	0.004	0.002
Methoxychlor	0.1	0.05
Toxaphene	0.005	0.0025
2,4-D	0.1	0.05
2,4,5-TP (Silvex)	0.01	0.005
Total Trihalomethanes	0.1	0.05
Benzene	0.005	0.0025
Carbon Tetrachloride	0.005	0.0025
p-Dichlorobenzene	0.075	0.0375
1,2-Dichloroethane	0.005	0.0025
1,1-Dichloroethylene	0.007	0.0035
Methyl Tertiary Butyl Ether (MTBE)	0.04	0.02
Tetrachloroethylene	0.005	0.0025
1,1,1-Trichloroethane	0.2	0.1
Trichloroethylene (TCE)	0.005	0.0025
Vinyl Chloride	0.002	0.001

TABLE 1. (continued)

Substance	Groundwater Quality Standard	Preventive Action Limit
	(milligrams per liter, except as noted)	
C. Microbiological		
Total Coliform Bacteria	zero	zero
D. Radionuclides		
Gross Alpha Particle Activity	15 pCi/liter	7.5 pCi/liter
Gross Beta Particle Activity	4 mrem/yr	2 mrem/yr
Radium 226 and Radium 228 combined	5 pCi/liter	2.5 pCi/liter

Note: The numerical groundwater quality standards in these regulations are based primarily on the maximum contaminant levels promulgated by the Rhode Island Department of Health in the Rules and Regulations Pertaining to Public Drinking Water, December 1990, and amendments thereto. As additional or revised maximum contaminant levels are adopted by the Rhode Island Department of Health, the new or revised maximum contaminant levels are incorporated herein by reference as groundwater quality standards for class GAA and class GA.

(iii) Current and future uses of surrounding property, groundwater and surface water;

(4) Violate or have any reasonable potential to cause a violation of surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto.

(b) In determining compliance with the groundwater quality standards for class GB and class GC at a facility, the Director may consider the factors below, in addition to other relevant information, provided by the facility owner or operator:

(1) Surrounding groundwater quality;

(2) Groundwater classification surrounding the facility;

(3) Surface water classification within the facility boundaries and surrounding the facility;

(4) Current and proposed future uses of groundwater and surface water at or within the facility boundaries;

(5) Current and proposed future uses of the facility;

(6) Uses of surrounding property, groundwater and surface water;

(7) Hydrogeologic characteristics of the facility and surrounding the facility, including, but not limited to, groundwater flow direction, hydraulic gradient, type of subsurface materials, and depth to bedrock;

(8) Actual and potential routes for human exposure and points of human exposure to the pollutant(s);

(9) Man-made pathways for pollutant movement off-site, e.g., underground utility lines; and

(10) Persistence and mobility of the pollutant(s) in the subsurface and the toxicity of the pollutant(s).

<u>Section 11.</u> REVIEW AND MODIFICATION OF GROUNDWATER CLASSIFICATION

11.01 <u>Groundwater Classification Changes by the Director:</u> The Director may from time to time propose changes in the groundwater classifications as more information becomes available. The changes shall be delineated in a manner consistent with section 9. At such time that the Director proposes a change in the groundwater classification, the Director shall initiate rule-making procedures.

11.02 Public Hearings: The Director may from time to time conduct public hearings to receive public comment on the groundwater classifications, groundwater quality standards, and preventive action limits.

11.03 Request for Modification of Groundwater Classification

(a) Any person who may be substantially and specifically affected may petition the Director to modify the classification assigned to particular groundwaters of the state.

(b) The petitioner for a reclassification shall specify the precise boundary in question and prove by clear, convincing and scientifically valid evidence that a reclassification is consistent with sections 11.05, 11.06, 11.07, or 11.08.

11.04 Reclassification Considerations: In evaluating a reclassification petition in accordance with sections 11.05, 11.06, 11.07, or 11.08, the Director shall consider the factors below, in addition to other relevant information, provided by the facility owner or operator for the location in question:

(a) Actual or potential threats to public health and/or the environment;

(b) Surrounding groundwater and surface water quality;

(c) Surrounding groundwater and surface water quality standards;

(d) Current and potential future uses of surrounding property, groundwater, and surface water; and

(e) Local and regional groundwater flow direction.

11.05 Upgrading Groundwater Classification: Where it has been proven by clear, convincing and scientifically valid evidence that the groundwater quality of an area meets the standards of a higher quality groundwater classification than the current classification or that the classification delineation pursuant to section 9.01(b) or 9.01(c)(2) is incorrect, the Director shall initiate rule-making procedures to upgrade the groundwater classification.

11.06 Changing Groundwater Classified GAA to GA: Where it has been proven by clear, convincing and scientifically valid evidence that groundwater classified GAA is not in an area described in section 9.01(a)(1)-(3), then and in that event, the Director shall initiate rule-making procedures for reclassification of such groundwater to GA.

11.07 Downgrading Groundwater Classified GAA or GA to GB: Where it has been proven by clear, convincing and scientifically valid evidence that groundwater classified GAA or GA does not meet the standards in section 10.02, the Director shall initiate rule-making procedures for reclassification of such groundwater to GB, provided that the area in question is located within one of the areas described below:

(a) Contiguous with an existing area classified GB pursuant to section 9.01(c)(1);

(b) Within the permanent waste disposal area at inactive landfills or disposal sites or solid waste, hazardous waste, or sewage sludge; or

(c) The area immediately surrounding the waste disposal area, which the D. ector has designated not suitable for public or private drinking water use, at the following inactive and active facilities: landfills, land disposal sites for solid waste, hazardous waste, and sewage sludge.

11.08 Downgrading of Groundwater Classification to GC

(a) Groundwater reclassification to GC is required for proposed sites for solid waste landfills and proposed sites for hazardous waste disposal facilities. Such facilities are the only uses for which groundwater will be reclassified to GC.

(b) Groundwater reclassification to GC will not be considered until an application for a solid waste disposal license has been filed with the Department pursuant to the Rules and Regulations for Solid Waste Management Facilities, January 1992, and amendments thereto or pursuant to the Rules and Regulations for Hazardous Waste Generation, Transportation, Treatment, Storage and Disposal, October 1988, and amendments thereto.

(c) Groundwater currently classified GA and GB may be reclassified to GC for proposed sites for solid waste landfills and proposed sites for hazardous waste disposal facilities. Groundwater classified GAA or designated GAA Non-attainment shall not be reclassified to GC.

(d) In order to reclassify groundwater to GC, the applicant must submit to the Department a site-specific study which demonstrates by clear, convincing, and scientifically valid evidence that the groundwater quality standards for GC in section 10.03(a) will be met. The study shall include, but not be limited to, the following:

(1) A locus map using the U.S. Geological Survey 7.5 minute quadrangle map;

(2) Site plan at an appropriate scale (minimum scale of one inch equals fifty feet (1"=50')) to adequately show the location on and immediately surrounding the site of the following: property boundaries, buildings and other structures, roads, surface topography, surface water courses and wetlands, wells, water lines, sewer lines, individual sewage disposal systems and other waste disposal areas, and any other significant site features;

(3) Depth to groundwater, water table elevations, hydraulic gradient, groundwater flow direction, groundwater flow velocity, and water table map;

(4) Description of the unconsolidated materials (in both the unsaturated and saturated zones), including permeability, porosity, degree of stratification, and the capacity for pollutant attenuation;

(5) Depth to bedrock and bedrock characteristics, to include, but not be limited to,

weathering, jointing, faulting, fracture orientation and density;

(6) Aquifer characteristics including saturated thickness, hydraulic conductivity, and transmissivity;

(7) Groundwater quality on-site and surrounding the site;

(8) The hydraulic connection between nearby surface waters and groundwater;

(9) Location and distance off-site of the nearest surface water body that will receive runoff from the site and that surface water body that will receive groundwater flow from the site and the water quality classification of these surface water bodies.

(10) Public and private wells:

(i) Determine the number and location of public wells within three (3) miles of the site and the number and location of private wells within one (1) mile of the site, or the number and location of such wells within alternative distances agreed upon by the Director;

(ii) Determine or estimate the well depths;

(11) Current and most probable future uses of surrounding groundwater and surf[illegible] water;

(12) History of site ownership and operation;

(13) Volume and characteristics of the waste to be disposed of on the site;

(14) Specific methods and procedures to be utilized in the construction, operation, and maintenance of the facility necessary to contain or prevent migration of pollutants;

(15) Evaluation of the potential for migration of pollutants from the site and identification of potential impacts to groundwater and associated surface waters from the proposal.

Section 12. DETERMINATION OF COMPLIANCE WITH GROUNDWATER QUALITY STANDARDS AND PREVENTIVE ACTION LIMITS

12.01 General: Compliance with the groundwater quality standards and preventive action limits shall be determined through analytical tests of groundwater quality by the facility owner or operator. Where applicable, the Director may also require analytical tests of the effluent prior to the discharge to the groundwater. The Director may request verification of any test data or collect separate samples if it is deemed necessary.

(a) Groundwater samples and effluent samples shall be collected, stored, transported, and analyzed in accordance with the most recent United States Environmental Protection Agency approved procedures; the most recent "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association, et al.); or alternative methods approved by the Director.

(b) Groundwater and effluent sampling frequency and the list of parameters to test for shall be proposed to the Director by the facility owner or operator. The Director's determination of sampling frequency and the parameters to test for shall be made, in part, utilizing information provided by the facility owner or operator regarding the type of facility, waste generated, waste disposed of on site, materials stored or utilized on site and any site specific hydrogeologic characteristics that may be required by the Director.

12.02 Groundwater Monitoring Program

(a) All facilities that are required by the Director to monitor groundwater quality pursuant to these regulations and the Underground Injection Control Program Rules and Regulations, May 1984, and amendments thereto, shall implement a groundwater monitoring program approved by the Director. Groundwater monitoring done in compliance with the following Department regulations and federal programs are exempt from the provisions of section 12.02 but shall comply with section 12.03 regarding termination of groundwater monitoring:

(1) Rhode Island Oil Pollution Control Regulations, December 1990, and amendments thereto;

(2) Rhode Island Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials, April 1985, and amendments thereto;

(3) Rhode Island Rules and Regulations Pertaining to the Treatment, Disposal, Utilization and Transportation of Wastewater Treatment Facility Sludge, March 1991, and amendments thereto;

(4) Rhode Island Rules and Regulations for Solid Waste Management Facilities, February 1991, and amendments thereto;

(5) Rhode Island Rules and Regulations for Hazardous Waste Generation, Transportation, Treatment, Storage and Disposal, October 1988, and amendments thereto;

(6) Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases, as promulgated;

(7) Federal Comprehensive Environmental Response, Compensation and Liability Act (42 USC 9601 et seq.); and

(8) Federal Resource Conservation and Recovery Act (42 USC 6901 et seq.).

(b) The groundwater monitoring program to be approved by the Director shall includ minimum, the following:

(1) A locus map using the U.S. Geological Survey 7.5 minute quadrangle map;

(2) Site plan at an appropriate scale (minimum scale of one inch equals fifty feet (1"=50')) to adequately show the monitoring well locations, well casing elevations, and the location on and immediately surrounding the site of the following: property boundaries, buildings and other structures, roads, surface topography, surface water courses and wetlands, wells, water lines, sewer lines, individual sewage disposal systems and other waste disposal areas, and any other significant site features;

(3) A sufficient number of wells (minimum of three) at the appropriate locations and depths to permit detection of any pollutants in the groundwater;

(4) Well logs with detailed lithologic and well construction information; and

(5) Sampling schedule pursuant to section 12.01(b).

(c) Monitoring well construction shall be consistent with the standards set forth in Appendix I.

(d) Minimum site monitoring requirements:

(1) The static water table elevation shall be recorded at the time of monitoring; and

(2) A log containing static water table elevations and the sample analyses shall be maintained on-site by the facility owner or operator.

(e) Copies of sample results and water table measurements shall be submitted to the Director within thirty (30) days of the receipt of such information by the facility owner or operator.

(f) An approved groundwater monitoring program shall be valid for a duration specified by the Director.

(g) There shall be no change in a groundwater monitoring program without the approval of the Director. The Director may require a change in an approved monitoring program where such change is necessary to determine compliance with the groundwater quality standards.

(h) Any person transferring ownership or control of a facility having an approved groundwater monitoring program shall notify the Director of such transfer not less than thirty (30) days prior to the effective date of such transfer.

(i) Groundwater monitoring subject to these regulations and the Underground Injectio Control Program Rules and Regulations, May 1984, and amendments thereto, that was approved by the Director prior to the effective date of these regulations shall comply with all provisions of this section except for 12.02(b)(3) and (4) and 12.02(c) within one year.

12.03 Termination of Groundwater Monitoring: Groundwater monitoring required by the Director shall not be terminated without the approval of the Director.

(a) A facility owner or operator may petition the Director for termination of groundwater monitoring when one of the following conditions is met:

(1) For discharges to groundwater: The discharge to groundwater has ceased, the discharge system has been closed in accordance with the appropriate state and federal regulations, and there has been no violation of a preventive action limit or groundwater quality standard at the points of compliance for the number of samples and the time period established by the Director;

(2) At sites of groundwater remediation: There has been no violation of the groundwater quality standards at the points of compliance for the number of samples and the time period established by the Director; or

(3) At sites of suspected or potential discharges to groundwater and any other sites required by the Director to monitor groundwater quality: There has been no violation of the groundwater quality standards at the points of compliance for the number of samples and the time period established by the Director.

(b) Monitoring wells at sites where groundwater monitoring has been terminated shall be abandoned in accordance with the procedures established in Appendix I.

Section 13. POINTS OF COMPLIANCE

13.01 General: Any point where the groundwater quality is monitored or where groundwater is withdrawn for use, excepting points within a discharge zone or residual zone approved pursuant to this section, may be used to determine compliance with the groundwater quality standards for the area.

13.02 Facility Points of Compliance for Groundwater Quality Standards and Preventive Action Limits: The point or points of compliance to determine if pollutant concentrations are greater than a groundwater quality standard or preventive action limit shall be established by the Director at any point within or beyond the property boundary, provided that it is beyond a discharge zone, if such zone is approved by the Director pursuant to section 13.03, and provided it is beyond a residual zone, if such zone is approved by the Director pursuant to section 13.04.

13.03 Discharge Zone: In determining compliance with the groundwater quality standards and preventive action limits in these regulations for an active discharge to groundwater, the Director may approve, deny, or modify a discharge zone proposed by a facility owner or operator. A groundwater monitoring program or revised groundwater monitoring program prepared pursuant to section 12.02 shall be submitted to the Director at the same time that a discharge zone is proposed.

(a) Within this discharge zone, the pollutant concentrations in groundwater are allowed to be greater than the groundwater quality standards. Acceptable pollutant concentrations in the groundwater within a discharge zone shall be determined by the Director on a case-by-case basis. The Director may require that the groundwater quality within the discharge zone be monitored.

(b) The facility owner or operator proposing a discharge zone shall provide the Director with information on the site's hydrogeology and the characteristics of the discharge to groundwater.

(c) Prior to approval of a discharge zone, the facility owner or operator shall demonstrate by clear, convincing, and scientifically valid evidence that:

(1) All practical alternatives to a discharge to groundwater have been evaluated and no technically or economically feasible alternative exists;

(2) Every practical effort has been made to limit the pollutant concentrations in the discharge to groundwater by such means as, but not limited to, reducing the quantity of potentially contaminating substances in use, use of alternative substances, changes in the operational procedures at the facility, and pretreatment of the effluent;

(3) The area encompassed by the discharge zone is owned and controlled by the owner or operator of the facility, and the discharge zone is limited to the smallest area that is technically and economically feasible;

(4) The discharge to groundwater and the resulting groundwater quality in the discharge zone do not represent a threat to public health or the environment;

(5) There will be no violation of the groundwater quality standards established in section 10 beyond the discharge zone as a result of the proposed discharge;

(6) There will be no adverse impact on existing public or private drinking water wells as a result of the proposed discharge; and

(7) The groundwater within the discharge zone will not cause a violation of the surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto as a result of the proposed discharge.

13.04 <u>Residual Zone:</u> In determining compliance with the groundwater quality standards and preventive action limits in these regulations for groundwater remediation activities, the Director may approve, deny, or modify the designation of a residual zone proposed by the facility owner or operator.

(a) Within this residual zone, the pollutant concentrations in groundwater are allowed to be greater than the groundwater quality standards. Acceptable pollutant concentrations in the groundwater within a residual zone shall be determined by the Director on a case-by-case basis. The Director may require that the groundwater quality within the residual zone be monitored.

(b) Prior to approval of a residual zone, the facility owner of operator shall demonstrate by clear, convincing and scientifically valid evidence that:

(1) Every practical effort has or will have been made to decrease the pollutant concentrations in the residual zone;

(2) The area encompassed by the residual zone is owned and/or effectively controlled by the owner or operator of the facility, and the residual zone is limited to the smallest area that is technically and economically feasible;

(3) The pollutant concentrations in the groundwater within the residual zone do not or will not represent a threat to the public health or the environment;

(4) There will be no adverse impact on existing public or private drinking water wells as a result of the residual zone;

(5) At the conclusion of the remediation activities, there will be no violation of the groundwater quality standards established in section 10 beyond the residual zone; and

(6) The groundwater within the residual zone will not cause a violation of the surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto.

(c) Residual zones approved pursuant to this section shall be designated non-attainment areas pursuant to section 9.02.

Section 14. NOTIFICATION TO DEM OF VIOLATIONS OF PREVENTIVE ACTION LIMITS AND GROUNDWATER QUALITY STANDARDS

14.01 Exemptions from Provisions of This Section:

(a) Owners or operators of facilities which, prior to the effective date of these regulations, discovered groundwater quality at their facility does not comply with the groundwater quality standards in these regulations, provided that such information was previously reported to the Department; and

(b) Persons with knowledge of analytical test results from private wells that serve properties used exclusively for residential purposes.

14.02 Owners or operators of facilities that did not previously report to the Department the discovery prior to the effective date of these regulations, of groundwater quality at their facility that does not comply with the groundwater quality standards in these regulations, must comply with the notification provisions of these regulations, provided that the conditions requiring notification still exist after the effective date of these regulations.

14.03 Notification: Facility owners and/or operators that discharge to groundwater or have had a discharge or release to groundwater shall notify the Department when:

(a) A preventive action limit has not been met at any point of compliance at a facility that is required by the Director to monitor groundwater quality and where the groundwater is classified GAA or GA;

(b) A groundwater quality standard has not been met at any point of compliance at a facility in any groundwater classification;

(c) An alternative notification level established under a groundwater monitoring program approved by the Director pursuant to section 12 or other groundwater monitoring program approved by the Director pursuant to other regulations of the Department or the federal government has not been met; or

(d) The facility owner or operator has reasonable cause to believe that a discharge or release has occurred which may result in the violation of a preventive action limit and/or groundwater quality standard. Persons reporting spills of chemical and/or petroleum products to the Department pursuant to the immediate notification requirements of other state or federal laws and regulations are exempt from provisions of this section.

14.04 Immediate Notification: Nothing in these regulations shall exempt facility owners or operators from immediate notification requirements as set forth in other Department regulations.

14.05 Notification Deadlines

(a) Notification required in section 14.02 shall be made to the Department in writing within six (6) months of the effective date of these regulations.

(b) Notification required in section 14.03 shall be made to the Department in writing within fifteen (15) days after discovery of the occurrence requiring notification.

14.06 Notification Contents: Notification shall include, but not be limited to, the following:

(a) Name, address, telephone number of person notifying the Department and of the facility owner or operator;

(b) Date and time of the discovery and the circumstances surrounding the discovery of the occurrence requiring notification;

(c) Groundwater classification of the site;

(d) Location of the occurrence and a legal description of the site (plat and lot);

(e) Concentration of the pollutant(s) identified in the groundwater when notification is pursuant to section 14.03(a)-(c);

(f) Identification of the pollutant(s) in the discharge or release when notification is pursuant to section 14.03(d);

(g) Initial determination of the source of the pollutant(s) and an estimate of the extent of pollution; and

(h) Measures taken or proposed to be taken at the time of notification.

14.07 Certification Requirements: The notification shall include a statement signed by the facility owner or operator, or an authorized representative, that is responsible for the preparation and submittal of the notification certifying, to the best of their knowledge, that the notification is complete and accurate.

Section 15. FACILITY OWNER OR OPERATOR RESPONSES TO VIOLATIONS OF PREVENTIVE ACTION LIMITS AND GROUNDWATER QUALITY STANDARDS

15.01 Violation of a Preventive Action Limit: When a preventive action limit has not been met, the facility owner and operator are responsible for taking actions, which shall be subject to the approval of the Director, to meet the following objectives at the point of compliance:

(a) Minimize the concentration of the pollutant in the groundwater where technically and economically feasible;

(b) Regain and maintain compliance with the preventive action limit, unless the Director determines that it is not technically or economically feasible to attain the preventive action limit concentration, in which case the owner or operator shall achieve compliance with the lowest possible concentration that is technically and economically feasible; and

(c) Ensure that the groundwater quality standard is met at any point of compliance.

15.02 Violation of a Groundwater Quality Standard: When a groundwater quality standard has not been met, the facility owner and operator are responsible for taking actions, which shall be subject to the approval of the Director, to regain and maintain compliance with the groundwater quality standard at the point of compliance.

15.03 Potential for Violation of Preventive Action Limit and/or Groundwater Quality Standard: Where the Director has reason to believe that a discharge or release has occurred which is likely to enter the groundwaters of the state and result in the violation of a preventive action limit and/or groundwater quality standard, the Director is authorized to require the facility owner or operator to take action pursuant to section 15.04.

15.04 <u>Responses to Violation of a Preventive Action Limit or a Groundwater Quality Standard:</u> responses the Director may require of the facility owner or operator when a preventive action limit or groundwater quality standard is not met at a point of compliance or a discharge or release is suspected that may result in the violation of a preventive action limit or groundwater quality standard at a point of compliance include, but are not limited to, the responses listed below. The Director may require more than one response.

(a) Resample groundwater quality at the point of compliance.

(b) Collect and submit additional data on groundwater quality on site or surrounding the site, hydrogeologic characteristics, and/or facility practices.

(c) Arrange for the sampling of drinking water wells which may be adversely affected.

(d) Install and sample monitoring wells. Such wells shall be in compliance with the construction standards in Appendix I, unless otherwise approved by the Director.

(e) Require the establishment of a groundwater monitoring program pursuant to section 12 or other groundwater monitoring program approved by the Director pursuant to other regulations of the Department or the federal government, or require a change in an existing groundwater monitoring program.

(f) Require a revision of the operational procedures at the facility.

(g) Require a change in the design or construction of the facility.

(h) Require an alternate method of waste treatment or disposal.

(i) Require the facility owner or operator to conduct a groundwater assessment and prepare a report pursuant to section 15.06, or another report pursuant to other applicable Department regulations, that is subject to the Director's review and approval. Based on the results of this report, the Director may require further investigation.

(j) Require cessation of any prohibited discharges to groundwater.

(k) Require prohibition of an activity.

(l) Require the facility owner or operator to provide drinking water to those persons that do not have a potable water supply (for violation of groundwater quality standard only).

(m) Require the facility owner or operator to conduct a groundwater investigation and prepare a report pursuant to section 15.07, or another report pursuant to other applicable Department regulations, to adequately assess the nature and extent of pollution. Such report shall be subject to the Director's review and approval.

(n) Require remedial action to restore groundwater quality to levels established by the Director pursuant to section 16.

15.05 Determination of the Response: In evaluating a violation of a preventive action limit or groundwater quality standard, and in determining the appropriate response required of the facility owner or operator pursuant to section 15.04, the Director may consider the following information provided by the facility owner or operator, in addition to all other relevant information:

(a) Surrounding groundwater quality;

(b) Geographic extent of pollutant migration;

(c) Hydrogeologic conditions;

(d) Present and future uses of the groundwater on-site and in the surrounding area;

(e) Reliability of sampling data;

(f) Performance of the activities at the facility;

(g) Water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto, for those surface waters receiving groundwater from the site; and

(h) Other known or suspected sources in the area of the substance that is identified as in violation of the preventive action limit or groundwater quality standard.

15.06 Groundwater Assessment Report

(a) The groundwater assessment report shall be prepared by a person with appropriate qualifications, and it shall include, but not be limited to, the following information, unless otherwise specified by the Director:

(1) All information previously reported to the Director pursuant to section 14 and/or information reported to the Director in accordance with emergency response procedures of other applicable state and federal laws and regulations. The facility owner or operator may elaborate and expand on any and all information found in previous reports. The facility owner or operator shall correct any incorrect information or interpretations contained in previous reports as part of the site characterization;

(2) A locus map using the U.S. Geological Survey 7.5 minute quadrangle map;

(3) Description of past and present activities on the site, including a list of past owners and operators of the site and approximate time periods of occupancy;

(4) A compliance history of the site including any and all past environmental enforcement actions and documentation of any past discharges or releases;

(5) Site plan at an appropriate scale (minimum scale of one inch equals fifty feet

(1"=50')) to adequately show the location on and immediately surrounding the site of the following: property boundaries, buildings and other structures, roads, surface topography, surface water courses and wetlands, wells, water lines, groundwater monitoring wells, materials storage areas (including underground storage tanks), sewer lines, individual sewage disposal systems and other waste disposal areas;

(6) Names and addresses of the owners and tenants of all properties that abut the site;

(7) Description of the site's hydrogeology, including, but not limited to, depth to groundwater, groundwater flow direction, and a description of the unconsolidated materials, including soil characteristics;

(8) Location and distance off-site of the nearest surface water body that will receive runoff from the site and the water quality classification of this surface water;

(9) Location of public wells within three (3) miles of the site or within an alternative distance of the site agreed upon by the Director;

(10) Information regarding private water supply as follows:

(i) Location of private wells on those properties that are wholly or partially within 500 feet of the site or a greater distance specified by the Director;

(ii) A description of the water supply sources and services available beyond 500 feet from the site and up to one mile from the site. The Director may require more specific detail.

(11) Identification of the pollutant(s) and an estimate of the geographic extent and volume of the affected area;

(12) A description of evidence of possible groundwater pollution, including, but not limited to, free liquids, stained soil, stressed vegetation, and the presence and volume of excavated materials.

(13) Results of any analytical testing of groundwater or soil on the site, including identification of methods used and sampling protocols;

(14) Recommendations for further groundwater investigation, groundwater remediation, or other actions; and

(15) Any other factors that the Director has reason to believe are necessary for an adequate groundwater assessment.

(b) Monitoring wells installed to collect groundwater quality data shall be in compliance with the construction standards in Appendix I, unless otherwise approved by the Director.

(c) The groundwater assessment report and any associated progress reports shall include the following statements signed by an authorized representative of the party specified:

(1) A statement signed by an authorized representative of the person who prepared the groundwater assessment report certifying, to the best of their knowledge, the accuracy of the information contained in the report; and

(2) A statement signed by the facility owner or operator responsible for the submittal of the groundwater assessment report certifying, to the best of their knowledge, that the report is a complete and accurate representation, and that it includes all known facts about the discharge to groundwater or the release that has, or may result in, the violation of a preventive action limit or groundwater quality standard.

15.07 Groundwater Investigation Report

(a) The groundwater investigation report shall be prepared by a person with appropriate qualifications, and it shall include all the elements of a groundwater assessment report described in section 15.06, and it shall also include, but not be limited to, the following information:

(1) Complete description of the site's hydrogeology, including, but not limited to, the following:

(i) Depth to groundwater, water table elevations, hydraulic gradient, groundwater flow direction, groundwater flow velocity, and water table map;

(ii) Description of the unconsolidated materials (in both the unsaturated and saturated zones), including permeability, porosity, degree of stratification, and the capacity for pollutant attenuation;

(iii) Depth to bedrock and bedrock characteristics;

(iv) Aquifer characteristics including saturated thickness, hydraulic conductivity, and transmissivity;

(v) The presence and effects of both natural and man-made barriers to and conduits for pollutant migration;

(vi) Surrounding groundwater quality;

(2) Description of the pollutant source and the events that caused the pollution;

(3) Extent of soil pollution;

(4) Extent of groundwater pollution;

(5) Map showing lines of equal pollutant concentrations in the groundwater; and

(6) Conclusions based on the site data and recommendations for groundwater remediation.

(b) Monitoring wells installed to collect groundwater quality data shall be in compliance with the construction standards in Appendix I, unless otherwise approved by the Director.

(c) The groundwater investigation report and any associated progress reports shall include the following statements signed by an authorized representative of the party specified:

(1) A statement signed by an authorized representative of the person who prepared the groundwater investigation report certifying, to the best of their knowledge, the accuracy of the information contained in the report; and

(2) A statement signed by the facility owner or operator responsible for the submittal of the groundwater investigation report certifying, to the best of their knowledge, that the report is a complete and accurate representation, and that it includes all known facts about the discharge to groundwater or the release that has, or may result in, the violation of a preventive action limit or groundwater quality standard.

Section 16. GROUNDWATER REMEDIATION

16.01 General: When groundwater remediation is required by the Director pursuant to section 15.04, the facility owner and operator are jointly and severally responsible for designing and implementing efforts to remediate the groundwater to achieve pollutant concentrations established by the Director.

16.02 Exemptions

(a) Groundwater remediation activities and groundwater remediation plans approved in writing by the Director prior to the effective date of these regulations are exempt from the provisions of section 16.06.

(b) Groundwater remediation plans prepared in accordance with the Department regulations and federal programs listed below are exempt from the provisions of section 16.06.

(1) Rhode Island Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials, April 1985, and amendments thereto;

(2) Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases, as promulgated;

(3) Federal Comprehensive Environmental Response, Compensation and Liability Act (42 USC 9601 et seq.); and

(4) Federal Resource Conservation and Recovery Act (42 USC 6901 et seq.).

16.03 Groundwater Quality Certification: Groundwater remediation plans, including those prepared pursuant to these regulations and the regulations and programs specified in section 16.02(b)(1)-(4), are subject to the requirements of groundwater quality certification in section 17.

16.04 Groundwater Remediation Objectives: Groundwater remediation activities shall be designed to meet the following objectives:

(a) Protect public health and the environment;

(b) Ensure compliance with the groundwater quality standards for the classification assigned to the groundwater of concern;

(c) Eliminate or contain the source of groundwater pollution and minimize the impacted area;

(d) Achieve pollutant concentrations that are consistent with proposed and anticipated future uses of the site;

(e) Prevent an adverse impact on surrounding uses of property, groundwater and surface water;

(f) Prevent the violation of surrounding groundwater quality standards; and

(g) Prevent the groundwater at the remediation site from causing a violation of the surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto.

16.05 Considerations for Remediation Decisions: The determination by the Director of remediation actions required of an owner or operator, the suitability of proposed remediation techniques, and the acceptable pollutant concentrations that may remain in groundwater after remediation may be based on, but not limited to, a consideration of:

(a) Relative threat to public health and the environment from the facility;

(b) The physical and chemical characteristics of the pollutant(s), including toxicity, persistence and potential for migration;

(c) Hydrogeologic characteristics of the site and surrounding the site;

(d) Current and potential future uses of groundwater and surface water at the site and surrounding the site;

(e) Groundwater classification at the site and surrounding the site;

(f) Other state and federal program priorities;

(g) Relative potential for adverse impacts on surrounding uses of property, groundwater and surface water;

(h) Relative potential for violation of surrounding groundwater quality standards;

(i) Relative potential for the groundwater at the remediation site to cause a violation of the surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto; and

(j) Reliability and technical feasibility of the proposed technologies for groundwater remediation.

16.06 Groundwater Remediation Plan: Where required by the Director, a groundwater remediation plan shall be prepared by the facility owner or operator.

(a) The groundwater remediation plan shall consist of, at minimum, the following:

(1) Groundwater assessment report pursuant to section 15.06, groundwater investigation report pursuant to section 15.07 (if such report was required), and any additional information the Director shall require;

(2) Proposed method for remediation, to include, but not be limited to, the following:

(i) Justification of the ability of the method to meet the remediation objectives;

(ii) Design standards and technical specifications for the design and construction of any equipment necessary for the proposed remediation;

(iii) Diagrams of any piping routes, instrumentation, and process flows;

(iv) Proposed plans for the disposal of any products or by-products from the remediation activities;

(3) Proposed schedule for implementation of the remediation plan; and

(4) Proposed groundwater monitoring program pursuant to section 12.

(b) The groundwater remediation plan and any associated progress reports shall include the following statements signed by an authorized representative of the party specified:

(1) A statement signed by an authorized representative of the person who prepared the groundwater remediation plan certifying, to the best of their knowledge, the accuracy of the information contained in the plan; and

(2) A statement signed by the facility owner or operator responsible for the preparation and submittal of the groundwater remediation plan certifying, to the best of their knowledge, that the plan is complete and accurate.

16.07 Approval of Groundwater Remediation: Groundwater remediation activities shall be proposed and implemented by the facility owner or operator, and they shall be done in a manner approved by the Director through the issuance of an order of approval unless otherwise specified by the Director. Emergency response procedures at sites of groun water pollution or the th-eat of pollution are exempt from the provisions of this section, and such procedures shall be conducted in accordance with other applicable state and federal laws and regulations.

(a) Upon review of the groundwater remediation plan, the Director shall approve the plan, approve the plan with conditions, require revisions to the plan, or deny approval of the plan based on a determination of the plan's ability to meet the groundwater remediation objectives in section 16.04.

(b) Orders of approval for groundwater remediation shall be valid for a time period specified by the Director.

(c) Any person transferring ownership or control of a facility having an approved groundwater remediation plan shall notify the Director of such transfer not less than thirty (30) days prior to the effective date of such transfer.

(d) Implementation of remedial activities approved by the Director does not discharge or otherwise release the facility owner or operator from responsibility for any adverse impacts to public health and the environment caused by pollutants in the groundwater at the site.

Section 17. GROUNDWATER QUALITY CERTIFICATION

17.01 Applicability: In order to determine compliance with groundwater classification, groundwater quality certification is required for proposed facilities and activities that have an actual or potential adverse impact on groundwater quality, including certain facilities and activities with no designed discharge to groundwater. Groundwater quality certification by the Department's Groundwater Section shall be a requirement for final Department approval of the applications or requests for the approvals, licenses, certifications, etc. below:

(a) Department approvals for groundwater remediation plans (including, but not limited to, remediation pursuant to: Rhode Island Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials, April 1985, and amendments thereto; Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases, as promulgated; federal Comprehensive Environmental Response, Compensation and Liability Act (42 USC 9601 et seq.); and federal Resource Conservation and Recovery Act (42 USC 6901 et seq.));

(b) Solid waste disposal licenses (Rhode Island Rules and Regulations for Solid Waste Management Facilities, February 1991, and amendments thereto);

(c) Hazardous waste treatment, storage, and disposal licenses (Rhode Island Rules and Regulations for Hazardous Waste Generation, Transportation, Treatment, Storage and Disposal, October 1988, and amendments thereto);

(d) Department approvals for land disposal, land application, and composting of sewage sludge

(Rhode Island Rules and Regulations Pertaining to the Treatment, Disposal, Utilization and Transportation of Wastewater Treatment Facility Sludge, March 1991, and amendments thereto);

(e) Department approvals for individual sewage disposal systems designed to treat ten thousand (10,000) gallons or more per day (Rhode Island Rules and Regulations Establishing Minimum Standards Relating to Location, Design, Construction, and Maintenance of Individual Sewage Disposal Systems, December 1989, and amendments thereto);

(f) Water quality certification for upland dredge disposal (Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto); and

(g) Any other department approval, license, certification, etc. for an industrial, commercial or institutional facility which has a reasonable potential for adversely impacting groundwater quality as determined by the Director.

17.02 Groundwater Quality Certification Review

(a) The applicant or, at the Department's discretion, a division of the Department shall notify the Department's Groundwater Section in writing of applications or requests for the Department approvals, licenses, certifications, etc. in section 17.01(a)-(g).

(b) The applicant shall provide information necessary for groundwater quality certification review. The review of proposals for groundwater quality certification will initially depend on the information provided to the Department division or section that received the application or request for the approvals, licenses, certifications, etc. listed in section 17.01(a)-(g). Additional information may be required in order to adequately review a proposal for groundwater quality certification.

(c) After reviewing a proposal, the groundwater quality certification shall be approved, denied, or approved with conditions and forwarded to the applicant and the Department division or section that received the application or request for the approval, license, certification, etc. listed in section 17.01(a)-(g).

(d) Failure to obtain groundwater quality certification shall be independent and sufficient grounds for Department denial of the application or request for the approvals, licenses, certifications, etc. listed in section 17.01(a)-(g).

17.03 Criteria for Groundwater Quality Certification Approvals: Facility owners or operators that are requesting groundwater quality certification must show by clear, convincing and scientifically valid evidence that:

(a) There is no substantial likelihood for violation of the groundwater quality standards in section 10, except within an approved discharge zone or residual zone pursuant to section 13 as a result of the proposed project requiring groundwater quality certification; and

(b) There is no substantial likelihood for groundwater impacted by the proposed project requiring groundwater quality certification to cause a violation of surface water quality standards established by the Rhode Island Water Quality Regulations for Water Pollution Control, October 1988, and amendments thereto.

17.04 Groundwater Quality Certification for Groundwater Remediation: Groundwater quality certification shall be required for all proposed groundwater remediation plans prepared pursuant to these and other state and federal regulations. Groundwater remediation activities and groundwater remediation plans approved by the Director in writing prior to the effective date of these regulations are exempt from the requirement to obtain groundwater quality certification.

(a) The Director's review of proposed groundwater remediation plans for groundwater quality certification shall be based on the ability of the remediation activities to meet the groundwater remediation objectives in section 16.04.

(b) Proposed termination of groundwater remediation activities and proposed changes in an active groundwater remediation plan that are deemed significant will require groundwater quality certification. Significant changes are defined as:

(1) Establishment of a residual zone pursuant to section 13;

(2) Any change in the operation of remediation activities that will result in pollutant concentrations in groundwater greater than that concentration proposed in the original or most recent groundwater remediation plan; and

(3) Any change in the operation of remediation activities that will result in groundwater quality achieving the desired pollutant concentrations over a longer period than what was proposed in the original or most recent groundwater remediation plan.

Section 18. WELLHEAD PROTECTION AREAS

18.01 Delineation of Wellhead Protection Areas: The Director shall delineate wellhead protection areas for the public water system wells in Rhode Island. This delineation shall be done in accordance with the requirements of the "Rhode Island Wellhead Protection Program," Rhode Island Department of Environmental Management, February 1990, and any amendments thereto.

18.02 Wellhead Protection Area Maps: The wellhead protection areas shall be delineated on 1:24000 scale maps. The 1:24000 scale maps shall be on file for review at the Rhode Island Department of Environmental Management, Groundwater Section, 291 Promenade Street, Providence, RI 02908. Smaller scale maps may be made available from the Department at the above address. The Director shall establish an appropriate fee, which shall be based on the costs of map reproduction, for copies of the wellhead protection area maps.

Section 19. VARIANCES

19.01 Variance Requests: A facility owner or operator may submit a written request to the Director for a variance from any of the provisions of these regulations. Such request for a variance shall include at a minimum:

(a) Name and address of the facility owner or operator, and the name and location of the facility for which the owner or operator seeks a variance;

(b) A list of the names and addresses of the owners and tenants of all properties that abut the facility;

(c) Identification of the specific section or sections of the regulations from which a variance is requested;

(d) A statement of the reasons for which the facility owner or operator seeks a variance. This statement shall specify the reasons that the facility owner or operator is unable to comply with these regulations, why a variance is necessary, and the reasons why a hardship is alleged. The person seeking the variance should separately and by number list each reason and any other mitigating factors he believes the Director should consider; and

(e) An explanation that the alternative procedures requested are substantially equivalent to the regulations herein in achieving protection of the public health and the environment.

19.02 Variance Decisions

(a) The Director may issue a variance under this rule when the facility owner or operator proves by clear, convincing and scientifically valid evidence that:

(1) Compliance with these rules would cause unreasonable or undue hardship;

(2) The issuance of the variance will have no adverse effect on public health and the environment; and

(3) The alternative procedures requested are substantially equivalent to the regulations herein in achieving protection of the public health and the environment.

(b) If the Director determines that there is widespread public interest or that the variance request raises major issues that could affect other facilities, then the Director may schedule a public hearing to solicit public comment prior to rendering a decision on the variance request.

(c) The Director's decision to grant or deny a variance shall be in writing and may, as a condition of granting the variance, impose appropriate requirements necessary to protect the public health and the environment.

Section 20. APPEALS

20.01 Where a groundwater quality certification constitutes a requirement for a license, permit or approval referenced in other rules and regulations promulgated by the Department, all appeals of such groundwater quality certification decisions shall be initiated following and in conjunction with a decision on the pending license, permit or approval.

20.02 Any person affected by a decision of the Director pursuant to these regulations may, in accordance with the Administrative Rules of Practice and Procedure for the Department of Environmental Management, file a claim for an adjudicatory hearing to review the decision. The party appealing a Department decision bears the burden of proving that their application complies with all requirements of the rules and regulations herein.

Section 21. SUPERSEDED REGULATIONS

On the effective date of these regulations, section 9.03 (Monitoring Well Abandonment) of the Rules and Regulations Governing the Enforcement of Chapter 46-13.2 Relating to the Drilling of Drinking Water Wells, filed with the Secretary of State December 15, 1989, is hereby revoked and superseded by section 9.0 of Appendix I of the regulations herein.

Section 22. PENALTIES

Penalties will be assessed in accordance with the Department's Rules and Regulations for the Assessment of Administrative Penalties for any violation of these regulations.

The foregoing regulations are hereby approved for filing with the Secretary of State in accordance with Chapters 42-35, 42-17.1, 42-17.6, 46-12, 46-13.1, 23-18.9, and 23-19.1 of the General Laws of Rhode Island, 1956, as amended.

Attest a true copy.

ENVIRONMENTAL STANDARDS BOARD

Barbara DeBuono
Barbara DeBuono
Director of Health

5/27/92
Date

for Harry J. Baird
Director of Administration

5-22-92
Date

Louise Durfee
Louise Durfee
Director of Environmental Management

5/21/92
Date

The foregoing "Rules and Regulations for Groundwater Quality", after due notice and hearing, are hereby adopted and filed with the Secretary of State, this 29th day of May 1992, to become effective twenty (20) days thereafter, in accordance the provisions of Chapters 42-35, 42-17.1, 42-17.6, 46-12, 46-13.1, 23-18.9, and 23-19.1 of the General Laws of Rhode Island, 1956, as amended.

Louise Durfee

Louise Durfee, Director
Department of Environmental Management

Notice given on: March 20, 1992

Public hearing held: April 7, 1992

Filing date: May 29, 1992

Effective date: June 18, 1992

RECEIVED
MAY 29 1992
SECRETARY OF STATE
ADMINISTRATIVE RECORDS DIV

I hereby certify that the enclosed is a true and accurate copy of the regulations being filed with the Secretary of State on the 29th day of May, 1992.

Alan T. Gates

NOTARY PUBLIC
My commission expires:
June ~~30~~ 9, 1993
a79

APPENDIX I

Monitoring Well Construction Standards and Abandonment Procedures

1.0 Applicability: The monitoring well construction standards herein apply to all permanent monitoring wells installed pursuant to these regulations. A monitoring well is designated permanent if it exists for more than 120 days. Section 9 of this appendix on monitoring well abandonment applies to all permanent and non-permanent monitoring wells,and it applies to those piezometers where improper abandonment would result in a reasonable likelihood of groundwater pollution. Additional requirements may be specified by the Director. Any exception to these standards requires prior approval by the Director.

2.0 Prevention of Groundwater Pollution: During well construction, every appropriate precaution shall be taken to prevent introducing pollutants into the groundwater, to include, but not be limited to, steam cleaning and washing of drilling rigs and proper cleaning and storage of well casing. Only potable water shall be used in well construction unless otherwise approved by the Director.

3.0 Well Casing: All permanent groundwater monitoring wells shall be constructed of PVC well casing material. All casing shall have a minimum inside diameter of 2.0 inches. Monitoring wells constructed in unconsolidated material less than 100 feet in depth shall be constructed using a minimum of schedule 40 PVC. Wells greater than 100 feet shall be constructed using a minimum of schedule 80 PVC.

3.1 Assembly and Installation: All casing shall be constructed of flush threaded joints or threaded coupling joints. All joints shall be fitted with an "O" ring or wrapped with teflon tape. Solvent welded joints are not permissible without prior written permission of the Director.

3.2 Exceptions: The Director may allow alternate well casing material if the pollutant concentrations or geologic setting require an alternative construction. Alternative materials include but are not limited to: (a) Teflon; (b) stainless steel; or (c) uncoated or galvanized steel.

4.0 Well Screen: The well screen slot size shall retain at least 90% of the grain size of a filter pack or at least 60% of the grain size of the collapsed formation. Well screens on water table wells shall not exceed 15 feet in length. Well screens for piezometers shall not exceed 5 feet in length. Well screens shall be factory slotted. A bottom cap and sump sediment trap shall be installed.

5.0 Filter Pack: The filter pack shall be chemically inert, well rounded and well sorted glass beads or silica-based sand or gravel of uniform grain size. The filter pack must minimize the amount of fine material entering the well, and it must not inhibit the flow of water into the well. The filter pack shall extend no more than 5 feet above the well screen. The filter pack shall not pollute groundwater.

6.0 Sealing Requirements

6.1 Filter Pack Seal: All monitoring wells installed with a filter pack shall be constructed with a top of filter pack seal.

6.2 Annular Space Seal: All monitoring wells shall be installed with an annular space seal that has a permeability of 1 x 10^{-7} centimeters per second or less.

6.3 Ground Surface Seal: All monitoring wells shall be constructed with a continuous pour concrete ground surface seal. The ground surface seal shall extend to a minimum of 40 inches below the land surface and shall be flared such that the diameter at the top is greater than the diameter at the bottom. The top of the ground surface seal shall be sloped away from the well casing and shall be imprinted with the designation of the monitoring well.

7.0 Protective Cover Pipe: The protective pipe shall consist of a minimum 4 inch diameter metal casing with locking cap. The protective pipe shall extend from the bottom of the ground surface seal to a minimum of 24 inches above the land surface. There shall be no more than 4 inches between the top of the well casing and the top of the protective pipe. The monitoring well designation shall be indicated clearly on the protective cover pipe. A gas vent and a drain hole shall be installed. A high visibility guard post to prevent destruction of the well may be required. The Director may request additional protective devices as necessary. "Road boxes" will be acceptable in locations where protective cover pipes are not suitable. All road boxes shall be locking and water tight.

8.0 Well Development: Development of all monitoring wells shall be performed no earlier than 48 hours after installation and before the initial water quality samples are taken. The goal of well development is to produce water free of fine sand and coarser material, all drill cuttings, and drilling fluids.

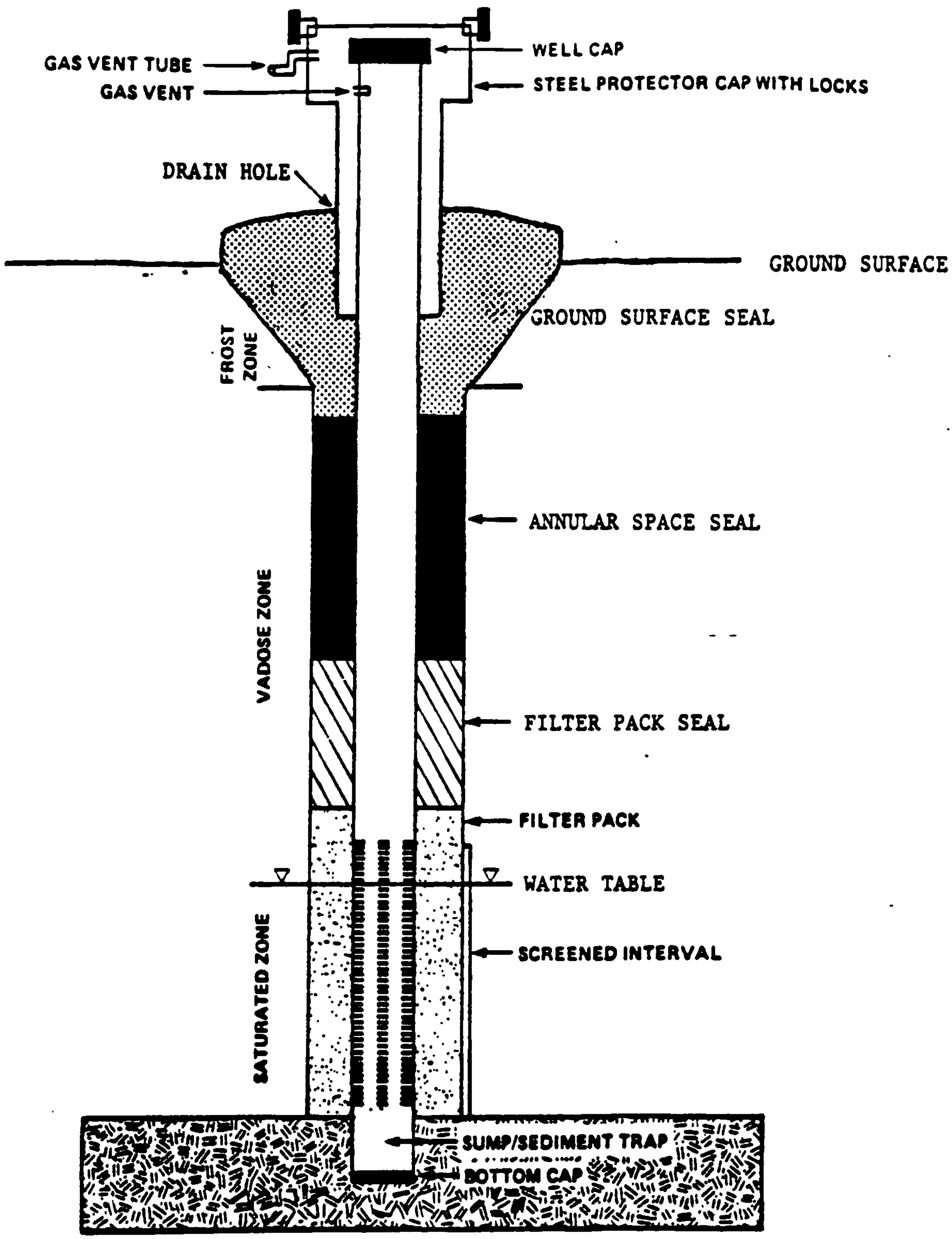
9.0 Monitoring Well and Piezometer Abandonment:

9.1 General: All monitoring wells and applicable piezometers as described in section 1.0 of this appendix that are no longer used to gather information on geologic or groundwater properties shall be abandoned pursuant to the provisions of section 9.2 of this appendix within 60 days after its use has been terminated, unless written approval is received from the Director for continued use.

9.2 Abandonment Procedures: The well shall be checked from the land surface through the entire depth of the well before it is sealed to ensure against the presence of any obstructions that will interfere with sealing operations.

(a) Wells constructed with an annular seal shall be abandoned by cutting off the casing a minimum of 4 feet below land surface. The remaining casing shall be completely filled with a neat cement grout or bentonite-cement grout. The remaining hole volume shall be backfilled with natural material, with the following exception: where backfilling with natural material would result in a grout plug less than 4 feet long, the hole shall be filled to approximately one foot from the ground surface with the neat cement grout or bentonite-cement grout.

(b) Wells not known to be constructed with an impermeable annular seal shall be abandoned by completely removing the well casing and sealing with neat cement or bentonite-cement grout to approximately one foot from the ground surface. If the casing cannot be removed during the abandonment of a well, the casing shall be thoroughly ripped or perforated from top to bottom, except that perforations will not be required over intervals of the well that are sealed with cement. The screened portion of the well and the annular space between the casing and the drillhole wall shall be effectively and completely filled with cement or bentonite-cement grout applied under pressure.



CROSS-SECTION OF TYPICAL MONITORING WELL

After US EPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document

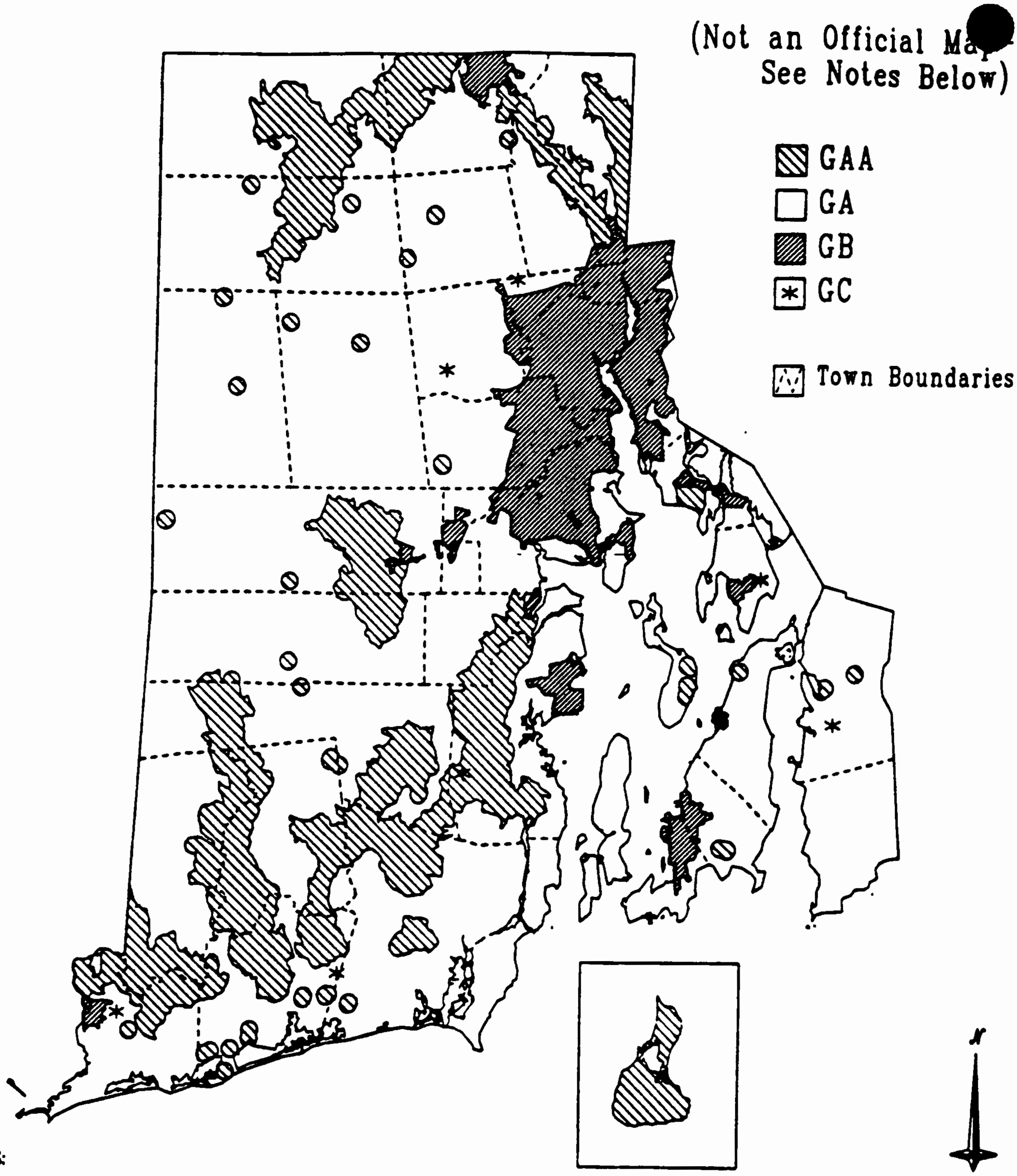
APPENDIX II

Groundwater Classification Map
(8.5" x 11")

Note: This is a generalized, unofficial map of the groundwater classifications. The official delineations were done at the 1:24,000 scale using the United States Geological Survey 7.5 minute quadrangle maps. These delineations are on file at the office of the Department's Groundwater Section.

GROUNDWATER CLASSIFICATION

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



NOTES:

Groundwater classifications were delineated on 1:24,000 scale U.S. Geological Survey quadrangle maps. Refer to these maps at the Groundwater Section, RIDEM, for the official delineation of the groundwater classifications.

Small areas of groundwater classified GB are not evident on above map.

Within the groundwater classified GAA and GA on the above map are areas where RIDEM has determined that the groundwater does not meet the standards for GAA and GA. These areas are called GAA Non-attainment and GA Non-attainment, and the long-term goal is restoration to GAA and GA standards. Refer to the larger scale maps produced by RIDEM for the delineation of these nonattainment areas.

Scale 1:420,0

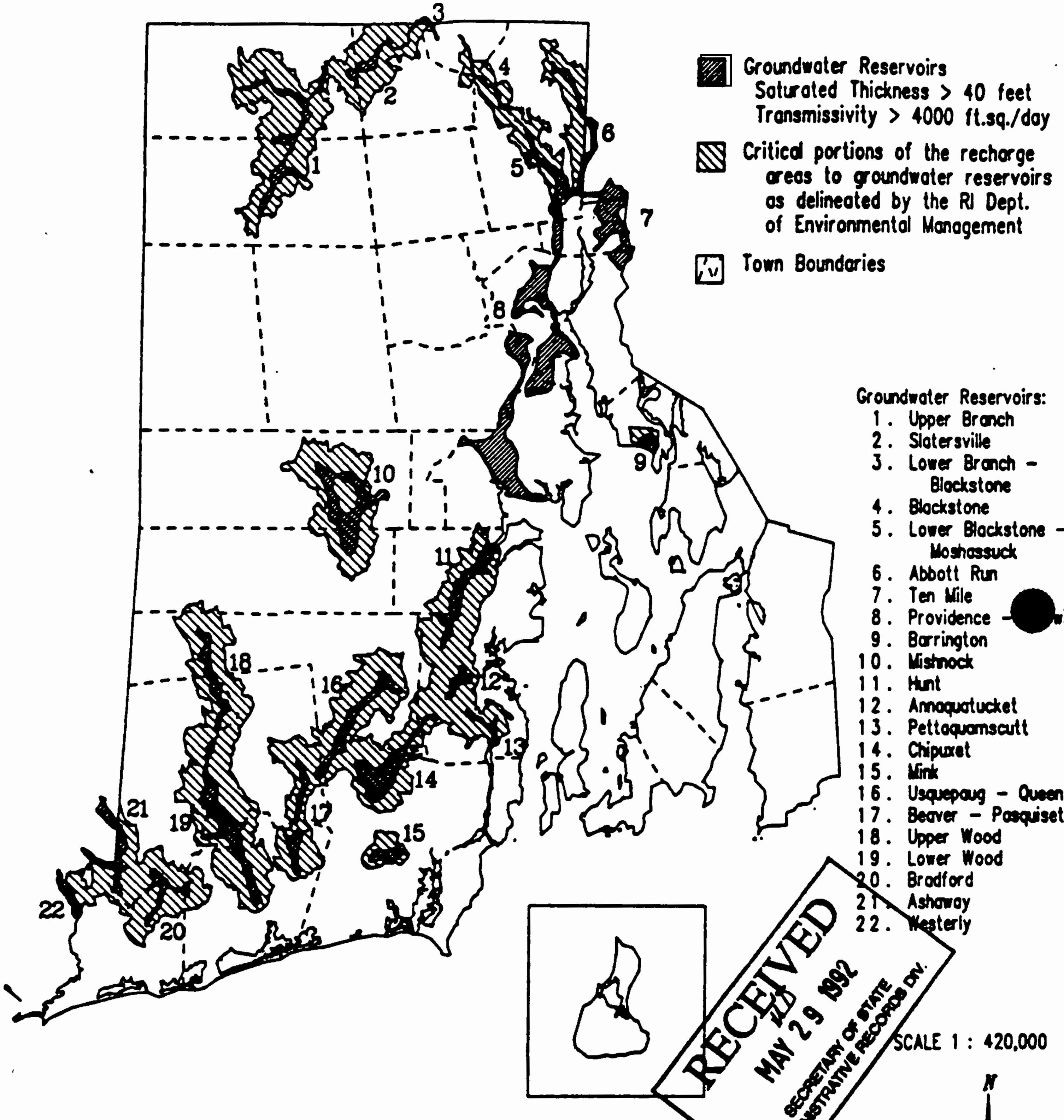
RIGIS

CPB 2-24-92

APPENDIX III

Map of Groundwater Reservoirs and the Critical Portions of Their Recharge Areas
(8.5" x 11")

GROUNDWATER RESERVOIRS AND THE CRITICAL PORTIONS OF THEIR RECHARGE AREAS



NOTES: RIDEM did not delineate recharge areas to those groundwater reservoirs or portions of groundwater reservoirs where the groundwater quality is known or presumed to be unsuitable for drinking water use without treatment.

The groundwater reservoirs were initially delineated by the R.I. Water Resources Board. Three groundwater reservoirs (#12, 14, 19) were modified by DEM using data from the U.S. Geological Survey.

APPENDIX A-2

Rhode Island DEM
Surface Water Quality Regulations

TRC

RHODE ISLAND WATER QUALITY STANDARDS

(Rhode Island Department of Environmental Management, Division of Water Resources; Rhode Island Water Quality Regulations for Water Pollution Control, Section 6 — Water Quality Standards; Adopted December 20, 1984, Effective January 9, 1985; Amended effective October 28, 1988)

6.1 Purpose. A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. Water quality standards are intended to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (the Act) and Chapter 46-12 of the General Laws of Rhode Island. "Serve the purposes of the Act" (as defined in Section 101(a)(2) and 303(c) of the Clean Water) means that water quality standards should, whenever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water and take into consideration their use and value of public water supplies, propagation of fish, shellfish, and wildlife, recreation in and on the water and agricultural, industrial, and other purposes including navigation.

Such standards serve the dual purposes of establishing the water quality goals for a specific water body and serve as the regulatory basis for the establishment of water-quality-based-treatment controls and strategies beyond the technology-based levels of treatment required by Sections 301(b) and 306 of the Clean Water Act.

6.2 Water Use Classification — The waters of the State shall be assigned to one of the classes listed below. Each class is defined by the most sensitive, and therefore governing, uses which it is intended to protect:

6.21 Freshwater —

Class A — (drinking) water supply

Class B — public water supply with appropriate treatment
— agricultural uses
— bathing, other primary contact recreational activities
— fish and wildlife habitat

Class C — boating, other secondary contact recreational activities
— fish and wildlife habitat
— industrial processes and cooling

*Class D — migration of fish
— good aesthetic value

*Class E — Nuisance conditions; uses limited to:
— certain industrial processes and cooling
— power
— navigation

* Classes D and E shall be used to describe an existing condition only, and shall not be considered an acceptable goal for classification of any water.

6.22 Sea Water —

Class SA — bathing and contact recreation
— shellfish harvesting for direct human consumption
— fish and wildlife habitat

Class SB — shellfish harvesting for human consumption after depuration
— bathing, other primary contact recreational activities
— fish and wildlife habitat

Class SC — boating, other secondary contact recreational activities
— fish and wildlife habitat
— industrial cooling
— good aesthetic value

6.3 Water Quality Criteria — The following physical, chemical and biological criteria are parameters of minimum water quality necessary to support the water use classifications of subsection 6.2 and shall be applicable to all waters of the State.

6.31 General Criteria — The following minimum criteria are applicable to all waters of the State, unless criteria specified for individual classes are more stringent:

1. At a minimum, all waters shall be free of pollutants in concentrations or combinations that will:

(a) Adversely affect the composition of a bottom aquatic life;

(b) Adversely affect the physical or chemical nature of the bottom;

(c) Interfere with the propagation of fish and shellfish; or,

(d) Undesirably alter the qualitative and quantitative character of the biota.

2. Aesthetics — all waters shall be free from pollutants in concentrations or combinations that:

(a) Settle to form objectionable deposits;

(b) Float as debris, scum or other matter to form nuisances;

(c) Produce objectionable odor, color, taste or turbidity; or,

(d) Result in the dominance of nuisance species.

3. Radioactive substances - The level of radioactive materials in all waters shall not be in concentrations or combinations which would be harmful to human, animal or aquatic life, or result in concentrations in organisms producing undesirable conditions.

4. Nutrients - Nutrients shall not exceed the site-specific limits necessary to control accelerated or cultural e

Best Management Practices shall be used to control sedimentation and erosion.

5. Thermal Mixing Zones - In the case of thermal discharges into tidal rivers or estuaries, or fresh water streams or estuaries, where thermal mixing zones are allowed by the Director, the mixing zone will be limited to no more than 1/4 of the cross sectional area and/or volume of river flow, stream or estuary, leaving at least 3/4 free as a zone of passage. In wide estuaries and oceans, the limits of mixing zones will be established by the Director.

6. Non-thermal Mixing Zones - In applying these standards the Director may recognize, where appropriate, a limited mixing zone or zone of initial dilution on a case-by-case basis. The locations, size and shape of these zones shall provide for the maximum protection of aquatic resources. At a minimum, mixing zones must:

(a) Meet the criteria for aesthetics;

(b) Be limited to an area or volume that will minimize interference with the designated uses in the segment;

(c) Allow an appropriate zone of passage for migrating fish and other rganisms; and

(d) Not result in substances accumulating in sediments, aquatic life or food chains to exceed known or predicted safe exposure levels for the health of humans or aquatic life.

6.32 Class-Specific Criteria - Fresh Waters

Criterion	Class A*	Class B	Class C	Class D
Dissolved oxygen	75% saturation, 16 hours/day, but not less than 5 mg/l at any place or time except as naturally occurs.	75% saturation, 16 hours/day, but not less than 5 mg/l at any place or time except as naturally occurs.	Minimum 5 mg/l any place or time, except as naturally occurs. Normal seasonal and diurnal variations above 5 mg/l will be maintained.	A minimum of 2 mg/l at any place or time, except as naturally occurs.
Sludge deposits-solid refuse-floating solids-oils-grease-scum	None Allowable.	None Allowable.	Sludge deposits, floating solids oils, grease and scum shall not be allowed except for such small amounts that may result from the discharge of appropriately treated sewage or industrial waste effluents.	
Color and turbidity	None other than of natural origin. Not to exceed 5NTU over background when the background is 50 NTU or less or have more than a 10% increase in turbidity when the background is more than 50 NTU.	None in such concentrations that would impair any usages specifically assigned to this Class. Not to exceed 10 NTU over background when the background is 50 NTU or less, or have more than a 20% increase in turbidty when the background is more than 50 NTU.	None in such concentrations that would impair any usages specifically assigned to this Class. Not to exceed 10 NTU over background when the background is 50 NTU or less, or have more than a 20% increase in turbidity when the background is more than 50 NTU.	None in such concentrations that would impair any usages specifically assigned to this Class.
Total Coliform bacteria/100 ml	Not to exceed a median value of 100 and not more than 10% of the samples shall exceed a value of 500.	Not to exceed a median value of 1,000 and not more than 20% of the samples shall exceed a value of 2,400.	None in such concentrations that would impair any usages specifically assigned to this Class.	None in such concentrations that would impair any usages specifically assigned to this this Class.
Fecal coliform bacteria/100 ml	Not to exceed a median value of 20 and not more than 10% of the samples shall exceed a value of 200.	Not to exceed a median value of 200, and not more than 20% of the samples shall exceed a value of 500.	Not applicable.	Not applicable.
Taste and odor	None other than of natural origin.	None in such concentrations that would impair any usages specifically assigned to this Class nor cause taste and odor in edible portions of fish.	None in such concentrations that would impair any usages specifically assigned to this Class nor cause taste and odor in edible portions of fish.	None in such conentrations that would impair any usages specifically assigned to this Class.

Criterion	Class A*	Class B	Class C	Class D
pH	As naturally occurs.	6.5 - 8.0 or as naturally occurs.	6.0 - 8.5***	6.0 - 9.0
Allowable temperature increase	None other than of natural origin.	Only such increases that will not impair any usages specifically assigned to this Class.**	Only such increases that will not impair any usages specifically assigned to this Class or cause the growth of unfavorable species of biota.	None except where the the increase will not exceed the recommended limits on the most sensitive water use and in no case exceed 9 °F.
9. Chemical	a. Waters shall be free from chemical constituents in concentrations or combinations which could be harmful to human, animal, or aquatic life for the appropriate most sensitive and governing water class use or unfavorably alter the biota. b. If an aquatic toxicity value has not been established in the R.I. DEM Ambient Water quality Guidelines (see Appendix B), then the level of any "priority pollutant" (see Appendix B) shall not exceed the "detection limits" in the ambient water unless the discharger demonstrates to the satisfaction of the Director that a higher concentration will not adversely effect the most sensitive use of the water body. c. The ambient concentration of a pollutant in a water body designated as suitable for fish and/or wildlife habitat shall not exceed the Ambient Water Quality Guidelines, (see Appendix B) for the protection of aquatic organisms from chronic effects, unless the chronic guidelines is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C. d. The limits prescribed by the United States Environmental Protection Agency will be used where not superseded by more stringent State requirements.			The ambient concentration of a pollutant in a water body designated as suitable for fish mitigation shall not exceed the R.I. DEM Ambient Water Quality Guidelines (see Appendix B) for the protection of aquatic organisms from acute effects, unless the the acute guideline is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C.
Phosphorus	None in such concentration that would impair any usages specifically assigned to said Class. New discharges of wastes containing phosphates will not be permitted into or immediately upstream of lakes or ponds. Phosphates shall be removed from existing discharges to the extent that such removal is or may become technically and reasonably feasible.			

* Class A waters used for drinking water supply may be subject to restricted use by State and local authorities.

** The temperature increase shall not raise the temperature of the receiving waters above the recommended limit on the most sensitive receiving water use and in no cases exceed 83 degrees F. In no case shall the temperature of the receiving water be raised more than 4 degrees F. Heated discharges into designated coldwater habitats shall not raise the temperature above 68 degrees F outside an established thermal mixing zone.

*** In accordance with 40 CFR, Part 133.102 (c), those facilities achieving the level of effluent quality attainable through the application of secondary or equivalent treatment may discharge an effluent pH of 6.0 to 9.0 (S.U.) standard units.

6.33 Class-Specific Criteria - Sea Waters

Criterion	Class SA	Class SB	Class SC
Dissolved oxygen	Not less than 6.0 mg/l at any place or time, except as naturally occurs.	Not less than 5.0 mg/l at any place or time, except as naturally occurs.	Not less than 5 mg/l during at least 16 hours of any 24-hour period not less than 4 mg/l at any place or time, except as naturally occurs.
Sludge deposits-solid refuse-floating solids-oils-grease-scum	None allowable	None allowable	None except that amount that may result from the discharge from a waste treatment facility providing appropriate treatment
Color and turbidity	None in such concentrations that would impair any usages specifically assigned to this Class. Not to exceed 5 NTU over background when the background is 50 NTU or less or have more than a 10% increase in turbidity when the background is more than 50 NTU.	None in such concentrations that would impair any usages specifically assigned to this Class. Not to exceed 10 NTU over background when the background is 50 NTU or less, or have more than a 20% increase in turbidity when the background is more than 50 NTU.	None in such concentrations that would impair any usages specifically assigned to this Class. Not to exceed 10 NTU over background when the background is 50 NTU or less, or have more than a 20% increase in turbidity when the background is more than 50 NTU.
Total Coliform bacteria per 100 ml	Not to exceed a median MPN of 70 and not more than 10% of the samples shall ordinarily exceed an MPN of 330 for a 3-tube decimal dilution.	Not to exceed a median value of 700, and not more than 10% of the samples shall exceed a value of 2300.	None in such concentrations that would impair any usages specifically assigned to this Class.
Fecal Coliform bacteria/100 ml	Not to exceed a median value of 15 and not more than 10% of the samples shall exceed a value of 50.*	Not to exceed a median value of 50, and not more than 10% of the samples shall exceed a value of 500.	None in such concentrations that would impair any usages specifically assigned to this Class.
Taste and odor	None allowable	None in such concentrations that would impair any usages specifically assigned to this Class and none that would cause taste and odor in edible portions of fish or shellfish.	None in such concentrations that would impair any usages specifically assigned to this Class and none that would cause taste and odor in edible portions of fish or shellfish.

Criterion	Class SA	Class SB	Class SC
pH	6.8 - 8.5	6.8 - 8.5	6.5 - 8.5**
Temperature increase:	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83 degrees F or in any case raise the normal temperature more than 1.6 degrees F, 16 June through September and not more than 4 degrees F from October through 16 June. All measurement shall be made at the boundary of such mixing zones as is found to be reasonable by the Director.		
Chemical constituents	a. None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.		
	b. None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class. The ambient concentration of a pollutant in a water body designated as suitable for fish and/or wildlife habitat shall not exceed the R.I. DEM Ambient Water Quality guidelines (see Appendix B) for the protection of aquatic organisms from chronic effects, unless the chronic guideline is modified by the Director based on results of bioassay tests conducted in accordance with the terms and conditions provided in Appendix C.		
	c. None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this Class.		

If an aquatic toxicity value has not been established in the R.I. DEM Ambient Water Quality Guidelines (see Appendix B), then the level of any "priority pollutant" (see Appendix B) shall not exceed the "detection limits" in the ambient water unless the discharger demonstrates to the satisfaction of the Director that a higher concentration will not adversely effect the most sensitive use of the water body.

Guide, pending further research.

In accordance with 40 CFR, Part 133.102(c), those facilities achieving the level of effluent quality attainable ough the application of secondary or equivalent treatment may discharge an effluent pH of 6.0 to 9.0.

6.4 Water Quality Standards — All waters of the State have been categorized according to the water use classification of subsection 6.2 based on considerations of public health, recreation, propagation and protection of fish, shellfish, and wildlife, and economic and social development. The waters of the State are classified according to the list of water segments in Appendix A.

All small streams tributary to Class A waters shall be Class A. All other small streams where the classification is not indicated shall be Class B. All other fresh waters not classified shall be considered to be Class A until classified. All sea waters not classified shall be considered to be Class SA until classified.

6.41 Applicable Conditions — These water quality standards apply under the most adverse conditions, as determined by the Director according to sound engineering and scientific practices. For fresh water, most adverse conditions shall include a minimum average daily flow for seven consecutive days that can be expected to occur once in ten years. For tidal waters, most adverse conditions shall mean when the most unfavorable hydrographic and pollution conditions occur at the particular point of evaluation.

6.42 Federal Approval — These water quality standards are subject to approval by the administrator pursuant to subsection 303(c)(2) of the Clean Water Act.

6.43 Periodic Review - The Water Quality Standards shall be reviewed periodically and amended as necessary pursuant to section 18 of these regulations.

6.5 Low Quality Water — Any water whose quality falls below any of the criteria of subsection 6.3 corresponding to its classification as designated in subsection 6.2 shall be considered in violation of its water quality standard and unsatisfactory for the uses indicated for that class, except for any designated uses which the Director determines are not affected by the particular criterion which is violated. Classes D and E shall be used to describe an existing condition, and shall not be considered an acceptable goal for classification of any water. Freshwaters falling below any criterion for Class D shall be considered to be in a nuisance condition. Waters in their natural hydraulic condition may fail to meet their assigned water quality criteria from time to time due to natural causes, without necessitating the modification of assigned water use classifications.

6.6 Symbolic Representative f Water Quality Standards. — The Director shall issue maps from time to time which indicate assigned water use classification.

Appendix A: Water Quality Classification Descriptions

The chart used to delineate the seawater conditions and classification zones is the National Oceanic and Atmospheric Administration — U.S. Department of Commerce, United States, East Coast, Rhode Island - Massachusetts, Narragansett Bay. National Chart Catalog No. 1, Panel G, 3rd Ed., May 28, 1983, 13221. True bearings are used in the narrative description of the water bodies.

BLACKSTONE RIVER DRAINAGE BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Pascoag River, including Burlingame Reservoir and Pascoag Reservoir, and its tributaries to Pascoag Reservoir Dam	B	B
Pascoag River from Pascoag Reservoir Dam to confluence of Clear River	C	B
Chepachet River, including Keech Pond and Smith and Sayles Reservoir, to dam at Chepachet	B	B
Sucker Brook, including Sucker Pond and Steere's Pond, to confluence with Chepachet River, and Spring Grove Brook, including Spring Grove Pond to confluence with Chepachet River	B	B
Chepachet River from dam at Chepachet to confluence with Clear and Branch Rivers	C	B
Tarklin Brook including Tarklin Pond	B	B
Crookfall Brook, including Woonsocket Reservoir to confluence with Blackstone River	A	A
West Sneech Brook to confluence with Blackstone River	C	B
East Sneech Brook, including Sneech Pond, to Pawtucket Reservoir	A	A
Monastery Brook to confluence with Blackstone River	B	B

BLACKSTONE RIVER DRAINAGE BASIN (Cont'd.)

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Peters River from Massachusetts-Rhode Island state line to confluence with Blackstone River	C	B
Abbott Run Brook, including Pawtucket Reservoir and all tributaries to Rhode Island-Massachusetts state line	A	A
Abbott Run Brook from Massachusetts-Rhode Island state line to confluence with Blackstone River	A	A

PAWTUXET RIVER BASIN

RIVER SECTION	Present Water Quality Conditions	Classification
Scituate Reservoir and all tributaries thereto and North Branch Pawtuxet River and Scituate Reservior to 1/2 mile downstream from dam	A	A
North Branch Pawtuxet River from 1/2 mile downstream of Scituate Reservoir Dam to Fiskeville Dam	B	B
North Branch Pawtuxet River from Fiskeville Dam to the confluence of North and South Branches of the Pawtuxet River at River Point	C	C
Pawtuxet River from confluence of North and South Branches of the Pawtuxet River at River Point to the Pawtuxet Cove Dam at Pawtuxet	C/D	C
Meshanticut Brook to its confluence with Pawtuxet River	B	B
Three Ponds Brook to its confluence with Pawtuxet River	B	B
Pocasset River and its tributaries to Print Works Pond discharge	B	B
Pocasset River from discharge of Print Works Pond to its confluence with Pawtuxet River	C	C
Spectacle Pond	C	B
Mashapaug Brook from Spectacle Pond including Mashapaug Pond and all ponds in Roger Williams Park to its confluence with Pawtuxet River	C	C
Aldrich Brook to its confluence with Pawtuxet River	B	B
Big River and all its tributaries to its entrance into Flat River Reservoir at Harkney Hill Road Highway Bridge	A	A
Flat River Reservoir from Harkney Hill Road to South Main Street Highway Bridge, Washington on the South Branch of Pawtuxet River including all tributaries thereto	B	B
South Branch Pawtuxet River from South Main Street Highway Bridge, Washington to its confluence with Pawtuxet River	C	C
Tiogue Lake	B	B

PAWCATUCK RIVER DRAINAGE BASIN

RIVER SECTION	Present Water Quality Conditions	Classification
White Horn Brook to South of Kingston Road	A	A
White Horn Brook south of Kingston Road to its entrance into Worden Pond	B	B
Chipuxet River to Yawgoo Mill Pond Dam	A	A
Brook tributary to Chipuxet River just below Yawgoo Mill Pond	A	A
Chipuxet River from Yawgoo Mill Pond Dam to its entrance to Worden Pond, including Hundred Acre Pond	B	B
Chickasheen Brook to Yawgoo Pond	A	A
Chickasheen Brook from its entrance to Yawgoo Pond to its confluence with Usquepaug River	B	B
Fisherville Brook and Sodom Brook to its confluence with Queen River	A	A
Queens Fort Brook to 3/4 mile below Victory Highway	A	A
Queens Fort Brook from 3/4 mile below Victory Highway to confluence with Queen River	B	B
Queen River to entrance to Bear Swamp	A	A
Queen River from entrance to Bear Swamp to confluence of Queens Fort Brook	C	C
Queen River from confluence of Queens Fort Brook including Glen Rock Reservoir and Usquepaug River to confluence with Pawcatuck River	B	B
Pasquiset Pond and Pasquiset Brook	A	A
Beaver River to its confluence with Pawcatuck River	A	A
Meadow Brook to its confluence with Pawcatuck River	A	A
Indian Cedar Swamp and Brook	B	B
Roaring Brook to its confluence with Wood River	B	B
Wood River including Breakheart Brook, Acid Factory Brook, Flat River, Fall River and Parris Brook to the confluence of Roaring Brook	A	A
Wood River from confluence of Roaring Brook to dam at Wyoming	B	B
Wood River from dam at Wyoming to 3/4 mile downstream from confluence of Moscow Brook	C	C
Wood River from 3/4 mile downstream from confluence of Moscow Brook to confluence with Pawcatuck River	B	B
Brushy Brook to Sawmill Road	A	A
Grassy Pond and Grassy Brook to its entrance to Wincheck Pond	A	A

PAWCATUCK RIVER DRAINAGE BASIN (Cont'd.)

RIVER SECTION	Present Water Quality Conditions	Classification
Moscow Brook from and including Yawgoo Pond, Wincheck Pond and Locustville Pond to its confluence with Wood River	B	B
Conanchet Brook from and including Ashville Pond and Blue Pond to its confluence with Wood River	B	B
Poquiant Brook from and including Watchaug Pond to its confluence with the Pawcatuck River	B	B
Tomaquag Brook to its confluence with Pawcatuck River	A	A
Chapman Pond and Aguntaug Brook	B	B
Ashaway River to Ashaway Road highway bridge	A	A
Ashaway River from Ashaway Road highway bridge to confluence with Pawcatuck River	C	C
Pawcatuck River from and including Worden Pond to dam at Kenyon	B	B
Pawcatuck River from dam at Kenyon to 1½ mile downstream of Horseshoe Falls Dam at Shannock	C	C
Pawcatuck River from 1½ mile downstream of Horseshoe Falls Dam at Shannock to Carolina Dam	C	B
Pawcatuck River from Carolina Dam to Didle Hole	B	B
Pawcatuck River from Didle Hole to Meeting House Bridge	C	C
Pawcatuck River from Meeting House Bridge to dam at White Rock	B	B
Pawcatuck River to Main Street highway bridge - Westerly	C	C
Pawcatuck River from Main Street highway bridge in Westerly to Pawcatuck Rock	SC	SC
Pawcatuck River from Pawcatuck Rock to a line from Pawcatuck Point to Rhodes Point	SC	SB
Little Narragansett Bay and Watch Hill Cove from a line from Pawcatuck Point to Rhodes Point	SB	SA
Block Island Sound, west of Napatree Point	SA	SA

THAMES RIVER BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Croff Farm Brook to Rhode Island-Connecticut state line	B	B
Blackmore Brook including Cedar Swamp Pond and Wakefield Pond to Rhode Island-Connecticut state line	B	B

THAMES RIVER BASIN (Cont'd.)

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Keech Brook, including Peck Pond, to Rhode Island-Connecticut state line	B	B
Mary Brown Brook including Hawkins Pond, Clarkville Pond, Bowdish Reservoir, Wilbur Pond, and Lake Washington to Rhode Island-Connecticut state line	B	B
Cady Brook including Mowry Meadow Brook to Rhode Island-Connecticut state line	B	B
Whetstone Brook including Killingly Pond to Rhode Island-Connecticut state line	B	B
Moosup River to Rhode Island-Connecticut state line including all its tributaries	A	A
Pachaug Brook including Beach Pond to Rhode Island-Connecticut state line	B	B

WOONASQUATUCKET RIVER BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Stillwater River and its tributaries, including Nine Foot Brook and Waterman Reservoir, to its entrance into Stillwater Reservoir	B	B
Slack Reservoir and the brook from Slack Reservoir to Stillwater River	B	B
Sprague Upper Reservoir and Sprague Lower Reservoir to Stillwater River	B	B
Mountaindale Reservoir	B	B
Woonasquatucket River and Stillwater Reservoir	B	B
Woonasquatucket River and Stillwater Pond, Capron Pond and Georgiaville Pond	B	B
Woonasquatucket River from Georgiaville Pond Dam to Esmond Mill Drive	B	B
Woonasquatucket River from Esmond Mill Drive to its confluence with the Providence River in Providence	C	C

MOSHASSUCK RIVER BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Moshassuck River above and including Bleachery Pond, Barney Pond, and Olney Pond	B	B

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Moshassuck River downstream of Bleachery Pond to confluence with Providence River at Providence	C	C
West River including Wenscott Reservoir to 1/2 mile downstream of Mineral Spring Avenue	B	B
West River 1/2 mile downstream from Mineral Spring Avenue to confluence with Moshassuck River	C	B

TEN MILE RIVER BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Ten Mile River from Massachusetts-Rhode Island state line to Newman Avenue Dam	C	C
Ten Mile River from Newman Avenue Dam to confluence with Seekonk River	C	B
Seven Mile River from Massachusetts-Rhode Island state line to its confluence with Ten Mile River	C	C

SAUGATUCKET RIVER DRAINAGE BASIN

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Saugatucket River including Indian Lake and Saugatucket Pond to North Road, Peace Dale, South Kingstown	B	B
Rocky Brook including Asa Pond, Peace Dale Reservoir and Rocky Brook Reservoir to its confluence with Saugatucket River, Peace Dale, South Kingstown	B	B
Indian Run Brook including Indian River Reservoir to its confluence with Saugatucket River, Peace Dale, Kingstown.	C	B
Saugatucket River from Kingston Road in Peace Dale to the Main Street Dam in Wakefield (1.1 miles)	B	B

NARRAGANSETT BAY DRAINAGE BASIN

And Other Sea Waters

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Seekonk River from Main Street Dam, Pawtucket, to India Point, Providence	SC	SC
Providence River from Providence south to a line from Edgewood Yacht Club to Pomham Rocks	SD	SC
Providence River south of a line from Edgewood Yacht Club to Pomham Rocks and north of a line from Gaspee Point to Bullock Point	SC	SC
Providence River south of a line from Gaspee Point to Bullock Point and north of a line from the eastern extremity of Elgin Street, Conimicut to the entrance of Mussachuck Creek, Barrington	SC	SB
Providence River south of a line from the eastern extremity of Elgin Street, to the entrance of Mussachuck Creek, Barrington north and west of a line from Conimicut Point to Old Tower at Nayatt Point	SB	SB
Buckeye Brook from downstream end of Warwick Pond to Bay	C	B
Near shore areas from Conimicut Point to Warwick Neck Light	SA/SB	SA
Warren and Barrington Rivers from Massachusetts-Rhode Island State line to railroad bridges north of Rt. 103	SA/SB	SA
Warren and Barrington Rivers from railroad bridges north of Rt. 103 to a line from the concrete jetty at the north end of the Warren Town Beach through Nun Buoy 14 and its extension to the Barrington Shore	SC	SC
Warren River south of a line from the concrete jetty at the north end of the Warren Town Beach through Nun Buoy 14 and its extension to the Barrington Shore and north of a line from Adams Point to Jacobs Point	SB	SB
Upper Narragansett Bay in the vicinity of North Farm on the Bay south of line from the northernmost extremity of the breakwater at the North Farm marina easterly to the shore, and east and north of the breakwater at the North Farm marina (5 acres)	SA/SB	SB
Mount Hope Bay east and north of lines joining the following points: The end of Brayton's Point, Somerset Buoy R "4" and Borden's Wharf, Tiverton	SC	SC

RIVER SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Mount Hope Bay west and south of lines joining the following points: The end of Brayton Point, Somerset; Buoy R "4" and Borden's Wharf, Tiverton and east of lines joining the following points: the end of Gardner's Neck Road, Swansea; Buoy N "2", through Buoy C "3A" to Common Fence Point, Portsmouth; and north of a line drawn from Portsmouth to Tiverton at the Stone Bridge	SB	SB
Mount Hope Bay west and south of lines joining the following points: the end of Gardner's Neck Road, Swansea, Buoy N "2"; Buoy C "3A", and Common Fence Point, Portsmouth; south of a line from the first dock north of the entrance to the Kickamuit River and extended to the west shore and east of a line from shore to shore passing through the most westerly points of the two center piers of the Mount Hope Bridge	SB	SA
Kickamuit River from the Massachusetts-Rhode Island State line southerly to School House Road	B	B
Kickamuit River southerly from School House Road to Child Street Bridge	A	A
Kickamuit River southerly from Child Street Bridge to a line from the easternmost end of Smith Street to the north-Western most tip of Coggeshall penninsula	SA	SA
The Kickamuit River southerly from a line from the eastern most end of Smith Street to the northwestern most tip of the Coggeshall penninsula to the river mouth	SA/SB	SA
Stafford Pond and Sucker Brook to Rhode Island - Massachusetts state line	B	B
Sin and Flesh Brook to Fish Street	C	C
Sin and Flesh Brook from Fish Street to Main Street (Rt. 77) Tiverton	B	B
Adamsville Brook to Rhode Island-Massachusetts state line, Tiverton	B	B
Dundery Brook to Westinghouse Lane	B	B
Dundery Brook from Westinghouse Lane to 1 mile downstream of Westinghouse Lane (Little Compton, Rhode Island (1 mile))	C	C

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Dundery Brook from 1 mile downstream of Meetinghouse Lane to Briggs Marsh (1 mile)	B	B
Sakonnet River off the east shore of Portsmouth in the vicinity of Elmhurst Academy	SC	SC
Sakonnet River south and west of a line from the Rhode Island Department of Environmental Management range marker located approximately 1000 feet north of the eastern end of Sherwood Terrace Road, Portsmouth, Rhode Island, to Can Buoy 7 and north and west of a line from the Rhode Island Department of Environmental Management range marker located just north of McCorrie Point to Nun Buoy 10 (25 acres)	SC	SC
Bristol Harbor east of a line from McKee's Wharf on Bristol Neck to light at Coast Guard Station dock	SC	SC
Bristol Harbor west of a line from McKee's Wharf on Bristol Neck to light at Coast Guard Station and east of a line from the northern most indentation of Bristol Harbor to the northeast extremity of Hog Island and north of a line from the northeast extremity of Hog Island to McKee's Wharf on Bristol Neck	SB	SB
Inner Apponaug Cove	SC	SC
Outer Apponaug Cove and northwest of a line from Cedar Tree Point to end of Neptune Avenue on the west shore	SB	SB
Warwick Cove north of a line from boat ramp at Oakland Beach to rock abutment of abandoned railroad trestle on east shore	SB	SB
Greenwich Cove south of Long Point	SC	SC
Greenwich Cove north of Long Point and west of a line from the northerly point of Long Point to the southerly point of Chepiwanoxet Peninsula	SA/SB	SB
Potter Cove at Prudence Island	SA/SB	SA
The waters in the vicinity of East Ferry west of a line from Bryer Point to Lincoln Street (61 acres)	SA/SB	SB
West Passage off Jamestown in the vicinity of West Ferry, south and east of a line from the Rhode Island Department of Environmental Management range marker located at the western end of Watson Avenue to Dutch Island Light House and north and east of a line from the southwest corner of the Old Ferry dock to the northeast extremity of Dutch Island	SA/SB	SB

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
The waters within 500 feet of the firing pier of the U.S. Navy Torpedo Testing Station, Gould Island	SA	SA
The waters within a 35 foot radius of the outfall from the boat building facility at Arnold Point	SC	SC
The waters in the area easterly from a line drawn from Coggeshall Point southwesterly to the southeasternmost point of Dyer Island and the area easterly from a line drawn from Carr Point northwesterly to the southeasternmost point of Dyer Island	SC	SC
The waters in the vicinity of Taylor Point which are within a 300 foot radius of the Jamestown marine outfall sewer (7 acres)	SC	SC
The waters in the vicinity of Taylor Point, exclusive of those waters described above, south of a line from the northernmost extremity of Taylor Point to Can Buoy 13, north of a line from a point of land approximately 1000 feet south of the Newport Bridge to the northernmost extremity of Rose Island, and within 1000 feet of the shoreline of Jamestown (49 acres)	SA/SB	SB
The waters in the vicinity of Wharton's Shipyard which are south and west of a line from a point of land approximately 3000 feet north of Bull Point to the northernmost of "the Dumplings", and west of a line from the northernmost of the "Dumplings" to a point of land approximately 1000 feet north of Bull Point (17 acres)	SA/SB	SB
Waters in the vicinity of East Cove and Fort Wetherill which are west of a line from the northeast corner of the pier at Fort Wetherill to a point of land in the northern shore of East Cove	SA/SB	SB
Unnamed Brook from Greene Lane, Middletown, Rhode Island to East Passage, Narragansett Bay (1 1/2 mile)	C	B
Unnamed Brook upstream of Greene Lane to headwaters	B	B
Easton Pond, Middletown and Newport	B	B
East of a line from Ida Lewis Rock to the southern extremity of Goat Island, east of a line from the northern extremity of Goat Island to the west shore of Coasters Harbor Island, east of a line from the west shore of Coasters Harbor Island to the western extremity of Coddington Point and south and east of a line from the southwestern extremity of Coddington Point to the northern most point of the Coddington Cove breakwater	SC	SC

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
The area within 1000 feet off of Monroe Street (in the Fort Adams Naval housing complex) on the west shore of Fort Adams, east of line from Fort Adams Light to Rose Island Light to Buoy (FLR) Bell 14 and a line from Buoy (FLR) Bell 14 through Nun Buoy 16 at Coddington Point and its extension to the end (southeastern most point) of the Coddington Cove breakwater	SB	SB
Waters within a 600 foot radius of Greene Lane, Middletown	SA/SB	SB
The waters in the vicinity of Fort Adams, Newport, which are within a 300 foot radius of the Fort Adams marine outfall sewer (4.1 acres).	SC	SC
The waters in the vicinity of Coasters Harbor which are within 500 feet of the Newport marine outfall sewer (18 acres).	SC	SC
The waters in the vicinity of Piers No. 1 and No. 2 at the Davisville Depot that a south of a line from a northeast corner of Pier No. 2 (themore northerly pier at the Davisville Depot) to Nun Buoy 14, north of a line from the Rhode Island Department of Environmental Management range marker located on the bulkhead at approximately 300 feet south of Pier No. 1 (the more southerly pier at the Davisville Depot) to Nun Buoy 12, including all waters between the above described lines which are west of a line and the extension of a line from the northeastern end of the bulkhead at Quonset State Airport through Nun Buoy 16	SC	SC
The waters in the vicinity of Quonset Point within 1500 feet of shore from the western end of the carrier pier to a point 1000 feet north of Quonset Point	SC	SC
The waters in the vicinity of Quonset Point exclusive of those waters described above, north and east of the intersection of a line extending from Fourth Street, North Kingstown, southeast to the north-easternmost point on Fox Island and a line drawn from the Wickford Lighthouse to Buoy R 6, west of the line from Buoy R6 to Nun Buoy 10, south of the line from Nun Buoy 10 through F G Buoy 11 extended to the shore	SB	SB
Wickford Harbor including Mill Cove and Mill Creek west of a line from the northerly extremity of Big Rock Point to the easterly extremity of Cornelius Island, west and south of a line from the northerly extremity of Cornelius Island to a point 1000 feet north of Calf Neck and Mill Creek south of a line from Camp Avenue culvert and not including Wickford Cove	SB	SB

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Wickford Cove	SC	SC
Fry Brook southerly most branch and mainstem to the confluence of the Hunt River (1 1/2 miles)	C	B
Upper Fry Brook tributaries	B	B
Hunt River from French Town Road to Austin Road (1 1/2 miles)	C	B
Hunt River from Austin Road to tidal waters	B	B
Annaquatucket River, including Belleville Pond, Oak Hill Road, Kettle Hole Pond, and Secret Lake, to Boston Neck Road	B	B
West of the mouth of Bissel Cove	SB	SB
Silverlake, Carr Pond and adjoining brook	B	B
The waters in the vicinity of South Ferry within 500 feet of the University of Rhode Island Narragansett Bay Marine Campus (9 acres)	SC	SC
The waters in the vicinity of South Ferry Road, Narragansett, south of a line from the Rhode Island Department of Environmental Management range marker located approximately 1000 feet north of South Ferry Road to Dutch Island lighthouse and west of a line from the eastern extremity of Casey Point to the eastern extremity of Bonnet Shores and north of a line from the Rhode Island Department of Environmental Management range marker located approximately 1500 feet south of South Ferry Road to the northern extremity of Beaverhead, Jamestown	SA	SB
The waters in the vicinity of Tucker's Dock which are within a 500 foot radius of the South Kingstown/Narragansett Regional Sewage Treatment Plant outfall (18 acres)	SC	SC
The waters in the vicinity of Tucker's Dock, exclusive of those waters described above, which are within 2500 feet of any point on the shoreline between Continental Road and Hazard Avenue (207 acres)	SB	SB
The waters in the vicinity of Scarborough within 500 feet of the marine outfall sewer located approximately 2000 feet, bearing 133° from a point of land at the northern boundary of Fort Nathaniel Greene (18 acres)	SC	SC
The waters in the vicinity of Scarborough which are more than 500 feet but less than 1500 feet away from the marine outfall sewer located approximately 2000 bearings 133 degrees from a point of land at the northern boundary of Fort Nathaniel Greene (144 acres)	SB	SB

SECTION	PRESENT WATER QUALITY CONDITIONS	CLASSIFICATION
Upper Point Judith Pond north of Can Buoy 25 including the Saugatucket River downstream of the Main Street Dam (43 acres)	SB	SB
The waters in the vicinity of Galilee within 500 feet of the shore from the northern end at the breachway to the western side of the Great Island Road bridge	SB	SB
The waters in the vicinity of Jerusalem within 500 feet of the shore from the breachway to a point approximately 1000 feet north of the State Pier (23 acres)	SC	SB
The waters in the vicinity of Snug Harbor within 500 feet of shore from Gooseberry Road to High Point (24 acres)	SB	SB
Great Salt Pond, New Shoreham south of a line from a point 1000 feet northwest of Champlin's Dock to Can Buoy 5 and south-west of a line from Can Buoy 5 to a point 1000 feet north of the narrows on the southeast shore of the same pond	SA/SB	SB
The waters in the vicinity of Old Harbor which are within a 500 foot radius of the Block Island marine outfall (12 acres)	SC	SC
The waters in the vicinity of Old Harbor, exclusive of the waters described above, which are within 1000 feet from shore from a point 1000 feet north of the Block Island marine outfall sewer to a point 1000 feet south of the marine outfall sewer (31 acres)	SB	SB
The waters in the vicinity of Old Harbor west of a line from the fixed red light at the end of the northern breakwater to the shore at Pebbly Beach which are not included in the SB & SC areas above (23 acres)	SB	SB
All other sea waters of Narragansett Bay, Sakonnet River, Rhode Island Sound and Coastal ponds, Block Island Sound and coastal ponds not delineated above	SA	SA

APPENDIX B
R.I. DEM AMBIENT WATER QUALITY GUIDELINES FOR PRIORITY POLLUTANTS

I. Purpose. This Appendix contains the ambient water guidelines referenced in Sections 6.32 and 6.33 of the Rhode Island Water Quality Regulations as amended. The purpose of these guidelines is to use optimally and consistently all quality data pertaining to the aquatic toxicity of a pollutant in order to determine a concentration of that pollutant which will be protective of aquatic life. These guidelines will be used to assess the quality of any fresh, estuarine, or marine surface water body and to set permit limitations for any facility which discharges into such waters.

All guidelines are subject to site-specific modification procedures referenced in Sections 6.32 and 6.33 of the Regulations and described in Appendix C. In addition, permit limitations may be based on considerations other than aquatic organism toxicity (see definition of "effluent limitation").

This Appendix to the Regulations shall be revised annually or as necessary. Any amendments will be subject to public notice and public comment. It is expected that these guidelines shall be revised and updated as new pollutants are detected and new information becomes available.

All numerical concentrations and equations listed in this Appendix shall be termed collectively the "RIDEM Ambient Water Quality Guidelines".

In addition to the guidelines, table 4 of this Appendix contains a complete list of "priority pollutants".

II. Derivation of Fresh Water Guidelines. RIDEM guidelines for fresh water can be divided into two categories according to the methodology by which they were derived. The first set of fresh water guidelines was adopted from the EPA 1986 Water Quality Criteria, while the second set was developed using minimum data base requirements and an uncertainty factor approach. When evaluating a request for site specific modification of a guideline (see Appendix C), the methodology by which the guideline was derived should be considered. For this reason, the two sets of guidelines are listed separately below.

A. *EPA Water Quality Criteria*

EPA has published water quality criteria for the protection of aquatic life for 23 of the 126 priority pollutants (45 FR 79318 November 28, 1980 and as amended at 50 FR 30784, July 29, 1985). These pollutants are priority metals and pesticides, and PCBs and cyanide. The EPA Water Quality Criteria consist of both an acute concentration and a chronic concentration for each pollutant. To protect aquatic life, the one-hour average concentration of a pollutant should not exceed acute criteria while the four-day average concentration of a pollutant should not exceed the chronic criteria more than once every 3 years on the average. The methodology by which these EPA criteria were derived is given in the Federal Register announcement.

On 29 July 1985, EPA published in the Federal Register (50 FR 30784) revisions of the 1980 water quality criteria. These criteria, which have been adopted by the State, appear in Table I. A comprehensive summary of the most recent water quality criteria can be found in the EPA "Gold Book" (1986).

TABLE I

FRESH WATER AQUATIC LIFE CRITERIA
EPA 1986

Name	Acute (ug/l)	Chronic (ug/l)
Arsenic	360	190
Cadmium	$e^{(1.128[\ln H]-3.828)}$	$e^{(.7852[\ln H]-3.49)}$
Chromium III	$e^{(.819[\ln H]+3.688)}$	$e^{(.819[\ln H]+1.561)}$
Chromium VI	16	11
Copper	$e^{(.9422[\ln H]-1.464)}$	$e^{(.8545[\ln H]-1.465)}$
Lead	$e^{(1.273[\ln H]-1.46)}$	$e^{(1.273[\ln H]-4.705)}$
Mercury	2.4	0.012
Nickel	$e^{(.846[\ln H]+3.3612)}$	$e^{(.846[\ln H]+1.1645)}$
Selenium (Selenite)	260	35
Silver	$e^{(1.72[\ln H]-6.52)}$	acute/45 [a]
Zinc	$e^{(.8473[\ln H]+.8604)}$	$(.8473[\ln H]+.7614)$
—		
Aldrin	4	- [b]
Dieldrin	1	0.0019
Chlordane	2.4	0.0043

Name	Acute (ug/l)	Chronic (ug/l)
DDT	1.1	0.001
Endosulfan	0.22	0.056
Endrin	0.18	0.0023
Heptachlor	0.52	0.0038
Gamma-BHC (Lindane)	2.0	0.08
Toxaphene	0.73	0.0002
—		
Cyanide	22	5.2
PCBs	2	0.014

NOTES: H = hardness (mg/l as $CaCO_3$)

(a) No EPA chronic criteria is available for silver. The chronic value should be determined by dividing the acute value, given by the hardness equation, by an acute to chronic ratio of 45.

(b) - indicates that no data is available.

B. *Minimum Data Base Guidelines*

RIDEM has derived freshwater guidelines for many pollutants for which EPA Water Quality criteria are not available. In order for a guideline to be derived, the toxicity data base for the pollutants must meet minimum requirements. These guidelines are given in Table II.

The data base must contain at least two acute toxicity test results expressed as either an EC$_{50}$ or an LC$_{50}$ as specified in the EPA Water Quality Criteria Guidelines (45 FR 79343, 1980). "LC$_{50}$" is defined as the concentration of a test material in a suitable diluent at which 50 percent of the exposed organisms die during a specified time period. "EC$_{50}$" is defined as the concentration of a test material in a suitable diluent at which 50 percent of the exposed organisms exhibit a specified response during a specified time period.

The two acute toxicity test results shall consist of:

1. One daphnid (*D. magna* or *D. pulex*)
2. One fish, either:

(a) fathead minnow (*Pimephales promelas*)

(b) bluegill (*Lepomis macrochirus*)

(c) rainbow trout (*Salmo gairdneri*)

For every pollutant which meets these minimum data requirements, acute and chronic guidelines are derived using the following equations:

Lowest LC$_{50}$ or EC$_{50}$ $\times$ .05 = Acute guideline

Acute guideline $\div$ 45 = Chronic guideline

The uncertainty factor, .05, is intended to provide an adequate margin of safety to protect most aquatic organisms from acutely toxic effects. The uncertainty factor was selected by calculating uncertainty factor guidelines for those pollutants with EPA Water Quality Criteria. These guidelines were most similar to the EPA Water Quality Criteria when an uncertainty factor of .05 was used.

The acute guideline is divided by an acute to chronic ratio of 45 to yield the chronic guideline. This ratio was derived by the State of Michigan using all available acute to chronic values for priority pollutant tests performed on fresh water species. It was determined that 80% of the pollutants would have a geometric mean acute to chronic ratio of 45 or less.

The methodology by which these criteria are derived is similar to that used in the EPA Red Book (1976) which preceded the 1980 Water Quality Criteria.

TABLE II: RIDEM MINIMUM DATA BASE GUIDELINES

Name	Acute (ug/l)	Chronic (ug/l)
Acrolein	2.9	.06
Acrylonitrile	378	8.4
Antimony	450	10
Arsenic III (inorganic)	52	1.2
Benzene	265	5.9
Beryllium	7.5	.17
Carbon tetrachloride	1365	30
*Chlorinated benzenes		
Chlorobenzene	795	18
1,2,4-trichlorobenzene	75	1.7
1,2,3,5-tetrachlorobenzene	321	7.1
pentachlorobenzene	13	.28
*Chlorinated ethanes		
1,1,2-trichloroethane	900	20
1,1,2,2-tetrachloroethane	466	10
1,2-dichloroethane	5900	131
1,1,1,2-tetrachloroethane	980	22
pentachloroethane	362	8.0
hexachloroethane	49	1.1
*Chlorinated naphthalenes		
1-chloronaphthalene	80	1.8
*Chlorinated phenols		
2-chlorophenol	129	2.9
4-chlorophenol	192	4.3

TABLE II (con't)

Name	Acute (ug/l)	Chronic (ug/l)
2,4-dichlorophenol	101	2.2
2,4,5-trichlorophenol	23	.51
2,4,6-trichlorophenol	16	.36
2,3,4,6-tetrachlorophenol	7	.16
2,3,5,6-tetrachlorophenol	8.5	.19
pentachlorophenol	2.2	.05
4-chloro-2-methylphenol	15	.32
2,4-dichloro-6-methylphenol	22	.48
Chloroform	1445	32
*Dichlorobenzenes		
1,2-dichlorobenzene	79	1.8
1,3-dichlorobenzene	390	8.7
1,4-dichlorobenzene	56	1.2
*Dichloroethylenes		
1,1-dichloroethylene	580	13
*Dichloropropanes		
1,1-dichloropropane	1150	26
1,2-dichloropropane	2625	58
1,3-dichloropropane	303	6.7
2,4-dimethylphenol	106	2.4
*Dinitrotoluenes		
2,3-dinitrotoluene	17	.37
2,4-dinitrotoluene	1550	34
Diphenylhydrazine	14	.31

TABLE II (con't)

Name	Acute (µg/l)	Chronic (µg/l)
Ethyl benzene	1600	36
*Haloethers		
4-bromophenyl phenyl ether	18	.4
*Halomethanes		
Methylene chloride	9650	214
Bromoform	1465	33
Hexachlorocyclopentadiene	.35	.008
Isophorone	5850	130
Naphthalene	115	2.6
Nitrobenzene	1350	30
*Nitrophenols		
4-nitrophenol	414	9.2
2,4-dinitrophenol	31	.69
2,4,6-trinitrophenol	4235	94
2,4-dinitro-6-methyl phenol	12	.26
*Nitrosamines		
N-nitrosodiphenylamine	293	6.5

TABLE II (con't)

Name	Acute (µg/l)	Chronic (µg/l)
Phenol	251	5.6
*Phthalate esters		
Dimethyl phthalate	1650	37
Diethyl phthalate	2605	58
Butyl benzyl phthalate	85	1.9
Bis (2-ethyl hexyl) phthalate	555	12
*Polynuclear aromatic hydrocarbons		
Acenaphthene	85	1.9
Fluoranthene	199	4.4
Tetrachloroethylene	240	5.3
Thallium	46	1.0
Toluene	635	14
Trichloroethylene	1950	43

NOTE: * denotes chemical group

III. Derivation of Estuarine and Marine Water Guidelines. EPA 1986 Ambient Water Quality Criteria for estuarine and marine waters shall be adopted as State water quality guidelines for those pollutants for which they were derived. These guidelines are given in Table III. At this time, no minimum data base guidelines for priority pollutants in marine waters have been derived.

TABLE III

SALTWATER AQUATIC LIFE CRITERIA
EPA 1986

Name	Acute (ug/l)	Chronic (ug/l)
Arsenic III	69	36
Cadmium	43	9.3
Chromium VI	1100	50
Copper	2.9	2.9
Lead	140	5.6
Mercury	2.1	0.025
Nickel	75	8.3
Selenium (Selenite)	410	54
Silver	2.3	-
Zinc	95	86
Aldrin	1.3	-
Dieldrin	0.71	0.0019
Chlordane	0.09	0.004
DDT	0.13	0.001
Endosulfan	0.034	0.0087
Endrin	0.037	0.0023
Heptachlor	0.053	0.0036

Name	Acute (ug/l)	Chronic (ug/l)
Gamma-BHC (Lindane)	0.16	-
Toxaphene	0.21	0.0002
Cyanide	1.0	1.0
PCBs	10	0.03

IV. Detection Limits. If the State guideline for any pollutant is lower than the "detection limit" for that pollutant, the detection limit shall be considered to be the guideline.

V. Priority Pollutants Without Guidelines. Any pollutant listed on the most recent EPA priority list published in accordance with Section 307(a)(1) of the Clean Water Act (Table IV of this Appendix) for which there is no RIDEM Ambient Water Quality Guidelines shall be regulated in accordance with Section 6.32 and 6.33 of the Regulations.

Table IV
126 Priority Pollutants

The following comprise the list of toxic pollutants designated pursuant to Section 307(a)(1) of the Act:

1. acenaphthene
2. acrolein
3. acrylonitrile
4. benzene
5. benzidine
6. carbon tetrachloride (tetrachloromethane)

<u>Chlorinated Benzenes</u>

7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene

<u>Chlorinated Ethanes</u>

10. 1,2-dichloroethane
11. 1,1,1-trichloroethane
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane

<u>Chloroalkyl Ethers</u>

17. bis(2-chloroethyl) ether
18. 2-chloroethyl vinyl ether

<u>Chlorinated Napthalene</u>

19. 2-chloronapthalene

<u>Chlorinated Phenols</u>

20. 2,4,6-trichlorophenol
21. 4-chloro-3-methylphenol
22. chloroform (trichloromethane)
23. 2-chlorophenol

Dichlorobenzenes

24. 1,2-dichlorobenzene
25. 1,3-dichlorobenzene
26. 1,4-dichlorobenzene

Dichlorobenzidine

27. 3,3-dichlorobenzidine

Dichloroethylenes

28. 1,1-dichloroethylene
29. 1,2-trans-dichloroethylene

30. 2,4-dichlorophenol

Dichloropropane and Dichloropropene

31. 1,2-dichloropropane
32. 1,3-dichloropropene (cis and trans isomers)

33. 2,4-dimethylphenol

Dinitrotoluene

34. 2,4-dinitrotoluene
35. 2,6-dinitrotoluene

36. 1,2-diphenylhydrazine
37. ethylbenzene
38. fluoranthene

Haloethers

39. 4-chlorophenyl phenyl ether
40. 4-bromophenyl phenyl ether
41. bis(2-chloroisopropyl) ether
42. bis(2-chlorethoxy) methane

Halomethanes

43. methylene chloride (dichloromethane)
44. methyl chloride (chloromethane)
45. methyl bromide (bromomethane)
46. bromoform (tribromomethane)
47. dichlorobromomethane
48. chlorodibromomethane

49. hexachlorobutadiene

50. hexachlorocyclopentadiene

51. isophorone

52. naphthalene

53. nitrobenzene

Nitrophenols

54. 2-nitrophenol

55. 4-nitrophenol

56. 2,4-dinitrophenol

57. 4,6-dinitro-2-methylphenol

Nitrosamines

58. N-nitrosodimethylamine

59. N-nitrosodiphenylamine

60. N-nitrosodi-n-propylamine

61. pentachlorophenol

62. phenol

Phthalate Esters

63. bis-(2-ethylhexyl) phthalate

64. butyl benzyl phthalate

65. di-n-butyl phthalate

66. di-n-octyl phthalate

67. diethly phthalate

68. dimethyl phthalate

Polynuclear Aromatic Hydrocarbons

69. benzo(a)anthracene (1,2-benzanthracene)

70. benzo(a)pyrene (3,4-benzopyrene)

71. 3,4-benzofluoranthene

72. benzo(k)fluorathene (11,12-benzofluoranthene)

73. chrysene

74. acenaphthylene

75. anthracene

76. benzo(ghi)perylene (1,12-benzoperylene)

77. fluorene

78. phenanthrene

79. dibenzo(ah)anthracene (1,2,5,6-dibenzanthracene)

80. indeno (1,2,3-cd) pyrene (2,3-o-phenylenepyrene)

81. pyrene

82. tetrachloroethylene

83. toluene

84. trichloroethylene

85. vinyl chloride (chloroethylene)

Pesticides and Metabolites

86. aldrin

87. dieldrin

88. chlordane (technical mixture and metabolites)

DDT and Metabolites

89. 4,4' -DDT

90. 4,4' -DDE (p.p' -DDE)

91. 4,4' -DDD (p.p' -TDE)

Endosulfan and Metabolites

92. a-endosulfan-Alpha

93. b-endosulfan-Beta

94. endosulfan sulfate

Endrin and Metabolites

95. endrin

96. endrin aldehyde

Heptachlor and Metabolites

97. heptachlor

98. heptachlor epoxide

Hexachlorocyclohexane

99. a-BHC-Alpha

100. b-BHC-Beta

101. g-BHC (lindane) Gamma

102. d-BHC-Delta

Polychlorinated Biphenyls (PCBs)

103. PCB-1242 (Arochlor 1242)

104. PCB-1254 (Arochlor 1254)

105. PCB-1221 (Arochlor 1221)

106. PCB-1232 (Arochlor 1232)

107. PCB-1248 (Arochlor 1248)

108. PCB-1260 (Arochlor 1260)

109. PCB-1016 (Arochlor 1016)

110. toxaphene

Metals, Asbestos and Cyanide

111. antimony and compounds

112. arsenic and compounds

113. asbestos

114. beryllium and compounds

115. cadmium and compounds

116. chromium and compounds

117. copper and compounds

118. cyanides

119. lead and compounds

120. mercury and compounds

121. nickel and compounds

122. selenium and compounds

123. silver and compounds

124. thallium and compounds

125. zinc and compounds

126. 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

APPENDIX C

Bioassay Protocol and Site Specific Modification of State Guidelines

I. Purpose. This appendix contains a protocol for performing bioassays on industrial and municipal effluents, and guidelines for using bioassay results to modify state guidelines for a given discharger. The purpose of this procedure is primarily to be used as a monitoring tool of the toxicity of permitted dischargers and to identify cases where the state guidelines are either too lenient or too stringent due to the specific composition of the effluent and/or the receiving water. Neither negative nor positive bioassay results shall warrant modification of the guideline automatically, but rather the merit of each potential case for modification shall be evaluated individually. In addition, permit limitations may be based on considerations other than aquatic organism toxicity (see definition of "effluent limitation").

II. Bioassay Protocol. Industrial and municipal dischargers may be required to perform bioassays in accordance with permit requirements or a request for additional information made by the Director in accordance with Section 46-12-18 of the R.I. Water Pollution Control Law.

The Director may require a variety of biomonitoring tests including: screening and range finding tests, and definitive tests for acute and chronic toxicity. Any further requirements by the Director shall be conducted in accordance with the latest EPA approved methods. Unless stated otherwise by the Director, the effluent shall be tested initially for acute toxicity according to the following protocol:

A. General

a. Facilities which discharge into fresh waters shall perform the test on both water fleas (*Daphnia manga or Daphnia pulex*) and fathead minnows (*Pimephales promelas*) age less than 30 days. Facilities which discharge to marine or estuarine waters shall perform the test on mysid (Mysidopsis sp.) age 1-5 days, and silverside (Menidia sp.) age less than 30 days, or other species as required by the Director.

b. The test may be static unless loss of DO due to high BOD or loss of potentially toxic volatile pollutants warrants use of a replacement or flow-through test procedure.

c. For single discharge situations, the effluent shall be diluted with receiving water collected immediately upstream of the effluent's zone of influence, unless indicated otherwise by the Director. For multiple discharge situations where the upstream water may contribute significantly to the toxicity of the effluent, the diluent shall be a designated raw water source unless indicated otherwise by the Director. Future tests may require use of upstream water and/or both upstream water and raw water as the diluent at the discretion of the Director on a case-by-case basis.

d. The report of test results shall include a No Observed Acute Effect Level (NOAEL) which is defined as the highest concentration of the effluent (in percent effluent) in which 90% or more of the test animals survive, and an LC_{50} which is defined as the concentration of the effluent which is lethal to 50% of the exposed organisms. The report shall identify the statistical technique(s) used to calculate the LC_{50} and the 95% confidence limits for the LC_{50}. The raw bench data shall be submitted with the report.

e. All chlorinated effluent samples must be received by the testing laboratory within 24 hours of the completion of sampling and testing must be initiated immediately upon receipt of the sample by the testing laboratory.

f. Acute bioassay tests shall be conducted in accordance with protocols listed in the latest edition of Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (EPA-600/4-85-013), incorporating any deviations from protocol listed herein, or additional methods if approved by the Director.

If selecting a consultant, the discharger should consider:

a. The commitment of management and staff to an effective quality assurance program.

b. Staff experience and education.

c. Adequate laboratory space and equipment to conduct testing.

d. Data handling, record keeping, review, interpretation and reporting.

e. Written test protocols and quality control practices.

B. Definitive Tests

a. Dischargers or their consultants shall test a representative composite sample of their effluent for acute toxicity.

b. The duration of the test shall be 48 hours for daphnia and 96 hours for all other species.

c. A portion of each effluent sample used for the toxicity testing will be chemically analyzed. DEM will advise the permittee of all pollutants requiring analysis after considering all contaminants listed in the application, anticipated to be present, or under consideration for limitation in a permit. In addition, the Department shall require chemical analysis of the dilution water if it is suspected to contain significant levels of pollutants.

C. Acute Range Finding Tests

a. Acute range finding toxicity tests are offered as a cost effective measure to provide the Permittee and the State with other much needed data. These tests are to include only ten organisms per 6 effluent concentrations (eg. 100, 75, 50, 25, 10, 1%) and dilution water as a control.

b. Dischargers or their consultants shall test a representative grab sample of their effluent for acute toxicity.

c. The duration of the test shall be 48 hours for all species tested.

III. Modification of Guidelines Based on Bioassay Results

In accordance with Section 6.32 and 6.33 of the regulations as amended, the RIDEM guidelines may be modified based on the results of bioassays in order to better represent site-specific conditions.

A. Modification of state guidelines may be warranted in either of two generalized cases:

1. If a discharger is in compliance with state ambient water quality guidelines given in Appendix B, yet bioassay test results demonstrate that the effluent is likely to cause toxic conditions in the receiving water, then the state guidelines shall not be considered protective for the given site and discharge, therefore, permit limitations may be adjusted to attain the non-chronically toxic level in the receiving water.

Bioassay results shall be interpreted in the following manner to determine if toxic conditions are likely to occur in the receiving water:

Equation 1:

$$Na = C_S \times \frac{NOAEL}{100}$$

Equation 2:

$$Nc = \frac{Na}{ACR}$$

Where:

NOAEL = No Observed Acute Effect Level, determined by toxicity tests and defined as the highest concentration of the effluent (in percent effluent) in which 90% or more of the test animals survive.

C_s = the concentration of the pollutant in the effluent sample before dilution (ug/l)

Na = the non-acutely toxic concentration of the pollutant (ug/l)

Nc = the non-chronically toxic concentration of the pollutant (ug/l)

ACR = acute to chronic ratio established for each pollutant using EPA and RIDEM water quality criteria documents or other more appropriate data. A default value of 45 shall be used if no reliable information is available.

For waters classified as B, C or SC, if Nc is less than RIDEM guideline, then the guideline may not be protective of water quality and modification may be warranted.

If the determination of significant positive bioassay results is made, the discharger must follow the procedures outlined below:

a. For uses which protect aquatic life and habitat, the concentration of each pollutant in the effluent shall not exceed the concentration which results in attainment of the non-chronically toxic level in the receiving water.

— Freshwater:

Using Nc from equation 2, the following equation shall be used to determine the appropriate concentration in the effluent for each pollutant that was detected during the test:

$$\text{Equation 3: } C_E = \frac{Nc\,(Q_u + Q_E)}{Q_E}$$

Where:

C_E = concentration in the effluent which will result in non-chronically toxic conditions in the receiving water under low flow conditions (ug/1)

Q_u = ten year, seven day low flow for the receiving water (MGD)

QE = flow of the effluent (MGD)

—Saltwater:

The non-chronically toxic effluent concentration for each pollutant in the effluent sample shall be calculated by multiplying Nc, from equation 2 with the appropriate dilution factor. The dilution factor shall be calculated for both near field and far field using equations in Section 17.12(b)(ii) of the RIPDES regulations, or other methods which are found to be acceptable by DEM.

b. The discharger shall conduct a Toxicity Reduction Evaluation. This evaluation shall include:

1. isolation of the sources of effluent toxicity.

2. determination of the specific causative pollutants if possible.

3. determination of the effectiveness of pollution control options in reducing the effluent toxicity.

4. demonstration of reduced toxicity using bioassays after the control option is installed.

Permits based on the results of the Toxicity Reduction Evaluation shall consist of limitations of specific toxic pollutants and/or limitations of pollutants which are proven to be indicators of toxicity.

2. If any discharger is discharging or proposes to discharge an effluent which is predicted to result in a violation of a RIDEM Ambient Water Quality Guideline for one or more pollutants in the receiving water after low flow dilution, the discharger may petition the Director to develop site specific criteria for the specific location and effluent based on significant negative bioassay results. If the results are determined to be significant by the Director, the site-specific protective effluent concentration (C) will be determined using equations 1 and 2, and either equation 3 or the marine water dilution equations in Section 17(b)(ii) of the RIPDES regulations. If the results of the bioassay, conducted to develop site specific limits, demonstrate that the effluent is likely to cause toxic conditions in the receiving water, the Director may develop permit limitations based on the results as outlined above.

B. The Director's evaluation f the significance of negative or positive bioassay results shall include:

1. the frequency and consistency of test results

2. the test protocol including:

a. number of species tested

b. survivability of the control group

c. test method (static, replacement, flow-through)

d. quality assurance and quality control used by the laboratory.

3. analyses of the effluent sample used in the bioassay; complexity and variability of the effluent.

4. similarity of dilution water used in the test to the the anticipated composition of the receiving water under worst case conditions.

5. relative certainty of the acute to chronic ratio used in bioassay interpretation.

6. relative certainty of the RIDEM Ambient Water Quality Guideline.

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

APPENDIX B
FIELD SAMPLING METHODOLOGY PLAN

STUDY AREA SCREENING EVALUATION
WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER,
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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TABLE OF CONTENTS

TABLE OF CONTENTS Cont'd.

Page

1.0 AMBIENT SURVEYS

Ambient surveys provide a means of measuring concentrations of volatile organic compounds, combustible gases and oxygen, and radiological activity during. Data produced from ambient surveys provide "real time" data from which field personnel may monitor site hazards, and act accordingly.

The following three ambient survey techniques will be used throughout the course of investigations at the subject study areas.

- Volatile Organic Compound Survey
- Radiological Survey
- Combustible Gas and Oxygen Survey

1.1 VOLATILE ORGANIC COMPOUND SURVEY

An ambient air monitoring program will be conducted at each site prior to and during field investigation activities. An OVA Flame Ionization detector (FID) (Century Organic Vapor Analyzer OVA 128, or equivalent) and a photoionization detector (PID) (HNu Model PI-101 Photoanalyzer with 10.2 eV lamp, or equivalent) will be used to survey the site area prior to sampling activities to assess individual site background conditions. During the site sampling activities these instruments will also be used to continuously monitor ambient and sample concentrations of volatile organic vapors.

Since instruments preforming measurements have inherent limitations arising from equipment limitations (fluctuations or drift) and changes in ambient conditions, instrument adjustments may be required to maintain their calibration. Calibration checks of the HNu and OVA will be preformed a minimum of twice per day (at the beginning and end of each day). The OVA and HNu will be calibrated with a hydrocarbon-free "zero" gas and a known hydrocarbon concentration. The OVA and HNu calibration gases consist of concentrations of 10 ppm methane in air and approximately 54 ppm isobutylene in air, respectively. Changes in instrument settings will be noted in the field notebooks under instrument calibration.

1.2 RADIOLOGICAL SURVEY

Pre-sampling radiological surveys will be conducted at select study areas. These surveys will be conducted with a Ludlum Model 19 Micro-R meter (or equivalent) and Ludlum Model 3 meter (equipped with a Model 44-9 pancake G-M detector) (or equivalent). The meters will be used to monitor for gamma, alpha, and beta radiation. The Model 19 meter utilizes an internally mounted, 1" x 1" sodium iodide (NaI) scintillator to offer an optimum performance in counting low-level gamma radiation. Five range divisions are provided on the Model 19 meter from which one may select the most desirable range in the 0-5,000 micro R/hr spectrum. Four range divisions are provided on the Model 3 meter with a dual scale meter dial having ranges of 0-4,000 cpm and 0-2 mR/hr. The meters will be checked throughout the day with a reference check source (Cs-137). Each of the meters are calibrated annually by the instrument manufacturer.

1.3 COMBUSTIBLE GAS AND OXYGEN SURVEY

Prior to initiating site activities, sites will be screened for combustible gases and oxygen with a combination combustible gas (lower explosive limit - LEL) and oxygen (O_2)meter. During subsurface explorations, or in any confined spaces, an LEL/O_2 meter will also be used continuously to measure for combustible gases and oxygen. The LEL/O_2 meter will be calibrated a minimum of twice per day (start and finish) with a pentane gas/oxygen mixture.

2.0 GEOPHYSICAL SURVEYS

Geophysical surveys provide a means of measuring: the electrical conductivity of subsurface soil, rock, and ground water through electromagnetics (EM); areas of anomalous magnetic field strength through magnetometer surveys, and subsurface profiles through ground penetrating radar.

During geophysical surveys, potential interferences to the survey data such as power lines, fences, and other surficial ferromagnetic objects will be noted in field notebooks. Base stations will also be established at each of the study areas from which electromagnetic and magnetic readings will be obtained during the surveys to account for natural variations in the Earth's magnetic field.

The geophysical surveys are being used to aid in determining subsurface conditions (e.g., fill/waste areas) at the study areas. The findings of the geophysical surveys may be used to "fine tune" planned soil, monitoring well, and/or test pit sampling locations. Significant deviations from this plan as a result of the geophysical survey findings will be discussed with representatives of the Navy, EPA, and RIDEM prior to implementation of such modifications.

The following three geophysical survey techniques will be used in the planned investigations of the subject study areas.

Electromagnetic (EM) Terrain Conductivity
Magnetometer
Ground Penetrating Radar

2.1 ELECTROMAGNETIC TERRAIN CONDUCTIVITY

The survey will be conducted using a Geonics EM-31 electromagnetic terrain conductivity meter, or equivalent. The EM-31 has a fixed intercoil spacing of 3.7 meters (12 feet) and an effective penetration depth of approximately 6 meters (20 feet). In general, the EM surveys will be used to aid in determining the location and/or extent of buried electrically conductive objects (e.g., tanks, drums, piping) and waste areas (pits, fill). This information may aid in "fine-tuning" the final locations for investigative borings and wells.

The EM surveys will be conducted continuously in the vertical dipole configuration along traverses spaced at intervals established in individual site work plans. EM measurements in the horizontal configuration will also be obtained at observed anomalies. More detailed EM surveys may be conducted around those areas suspected of having buried objects/materials and around areas of detected anomalies.

2.2 MAGNETOMETER SURVEY

The magnetic survey will be conducted with a Geometrics G-856 proton precession land magnetometer, or equivalent. The magnetic surveys will be used to identify areas of buried ferrous metal. The magnetic data will also aid in distinguishing any conductivity (EM-31) anomalies due to ferrous metal from electrically conductive, non-ferrous objects. The magnetometer utilizes the precession of spinning protons of the hydrogen atoms in a sample of fluid (kerosene, alcohol, or water) to measure total magnetic field intensity. The total magnetic field value measured by the proton precession magnetometer is the net vector sum of the ambient earth's field and any local induced and/or remanent perturbations.

The magnetometer surveys will be conducted continuously along traverses spaced at intervals established in individual site work plans. More detailed magnetometer surveys may be conducted around those areas suspected of having buried objects/materials and around areas of detected anomalies.

In addition to the magnetometer, a magnetic locator (Schonstedt Model GA-52B, or equivalent) will be used to investigate those areas where magnetic anomalies are detected with the EM-31. The magnetic locator is designed to locate buried ferromagnetic objects. The magnetic locator will be used to check subsurface investigation locations (i.e., borings and test pits) prior to drilling and/or excavation activities for the possible presence of unknown buried utilities and other buried hazards (e.g., drums, tanks). If unknown buried metallic objects are detected at a planned boring location, the sample location will be moved to avoid the detected anomaly. Any such discovered areas will be appropriately investigated (e.g. test pits) after further consideration and planning.

2.3 GROUND PENETRATING RADAR

Ground penetrating radar is an electromagnetic survey technique that reveals a graphic cross-sectional view of layered material below the ground surface. In a radar system, high frequency (radio waves at frequencies up to a thousand megahertz) impulses are generated by a transmitter. This impulse is directed downward into subsurface material. At subsurface material interfaces, a portion of the signal is reflected back to a surface antenna. For each impulse transmitted, a series of reflected impulses is returned in a time sequence proportional to the depth of the reflecting unit, thereby giving an indication of the number and depth of subsurface reflecting units.

GPR surveys are conducted by pulling the transmitter/antenna slowly along the pre-determined traverse. Depth to an identified reflector, such as a known pipe or geologic feature is used for vertical scale calibration. The depth of penetration of GPR is limited by attenuation of the transmitted impulse. Attenuation is a function of dielectric loss and of electrical conductivity loss, which varies between materials and the frequency of the impulses. Penetration depths can be increased by using a transmitter antenna of lower frequency. Although lower frequency antennae permit deeper penetration, they do not provide the greater resolution of higher frequency antennae. The specifications of the GPR equipment (e.g., antenna size(s), models) most appropriate for this project will be determined during pre-investigation site visits with geophysical subcontractors. Although site-specific factors will be considered in establishing the speed at which the GPR surveys will be performed, slower survey speeds (i.e. < 10 mph) are preferred.

3.0 SOIL GAS SURVEY

In general, soil gas sampling will be used at the study areas to aid in defining the presence, nature, and/or extent of subsurface volatile organic compound (VOC) contamination. Increased concentrations of gaseous VOCs are commonly present within pore spaces of VOC contaminated unsaturated soils, above contaminated buried wastes, and above contaminant plumes of ground water. Analysis of soil gas is an effective screening method to assess the presence and extent of an area contaminated with VOCs. The soil gas survey information is intended to aid in directing surface and subsurface investigation activities at individual sites.

The findings of the soil gas surveys may be used to "fine tune" planned sampling locations. Significant deviations from this plan as a result of the soil gas survey findings will be discussed with representatives of the Navy, EPA, and RIDEM prior to implementation of such modifications.

3.1 SAMPLING STRATEGY AND SAMPLE LOCATION

A grid has been established in individual site Work Plans to characterize appropriate areas in a systematic manner. The planned grids encompass the entire site area. Additionally, a set number of biased survey points has been established at each site at areas of concern. During the soil gas survey, the sampling grid will be extended, within Navy controlled property, to sufficiently define any areas of detected volatile organic contamination. Sampling points may be added to provide further definition, as judged necessary by the TRC-EC field team leader. Areas of staining or vegetative stress will be noted on a site map.

3.2 SOIL GAS SAMPLING METHODS

All soil gas points will be sampled by a truck mounted-hydraulic sampling device (e.g., geoprobe). Interconnectable lengths of 1" diameter steel pipe will be advanced by the hydraulic sampling device to the required sampling depth. The sampling depths will be assessed by evaluating the depth to water, potential contamination sources, and overburden material. In general, two to three samples will be collected per probe location. These samples may be collected from the interval just above the water table, at a mid-point in the vadose soil column, and approximately six feet below ground surface. Sampling will continue into bedrock as is necessary and possible (i.e. weathered rock) to collect such soil gas samples. Upon reaching the desired sampling depth, the bottom of the steel pipe will be opened and a small diameter stainless steel probe attached to teflon tubing will be lowered through the steel casing to the bottom of the hole. Packing material or an inflatable packer will be located just above the perforations at the base of the probe. This will isolate the sampling zone from the steel pipe annulus. Each soil gas sample will be collected from the prescribed depth through the probe after a pump, equipped with a vacuum gage, has extracted three apparatus air volumes from the probe. The soil gas sample will then be extracted from the air mass by inserting a glass gas tight syringe into the polyethylene tubing which connects the probe to the vacuum pump. The syringe will extract up to 1 ml of air, the exact volume extracted depends on the concentration of volatile organics in the sample. The sample will then be submitted to a climate-controlled mobile laboratory for "real time" analytical results.

Soil gas samples will be analyzed on a gas chromatograph equipped with a flame-ionization detector (FID). All soil gas samples will be screened for petroleum products using modified (for soil gas) EPA 602 procedures. Soil gas samples will also be run simultaneously through an electron capture detector (ECD) for chlorinated compounds typically contained in industrial solvents, following modified (for soil gas) EPA 601 procedures. Between all sample injections (including unknowns) the syringe will be heated to 60°C and flushed with UPC grade nitrogen. Standards will be analyzed in order to quantify the following compounds (to a reporting limit of 1.0 ug/l). A total FID volatiles compound concentration will also be calculated for each soil gas sample run.

The laboratory-grade gas chromatograph (GC) will be calibrated prior to the initiation of field work each day. Calibration curves for the GC will include at least three points, on which a linear regression will be run to determine the detector response curve. Analyte standards will be analyzed at intervals of every 10 soil gas samples during analysis. Check standards will also be run at the end of each day to gauge the calibration status. The GC will not analyze any samples if the correlation coefficients of any standardized compounds are less than 0.99.

Field blank samples are collected by drawing pre-purified nitrogen or ambient air (filtered through an MSA organic cartridge filter) through the sampling apparatus and probes prior to each days sampling activities, after every twentieth sample, and at the conclusion of each day. Field blank samples are labeled and analyzed in the same manner as the actual field samples and are visually indistinguishable from the actual field samples (i.e., blind to analyst).

Prior to each days work the soil gas steel pipe will be washed with a non-phosphate detergent/distilled water solution, and wiped dry with clean paper towels. The pipe will then be rinsed with distilled water and wiped dry with clean paper towels. The sampling probe will be washed externally with detergent/distilled water and scrubbed with clean paper towels. The exterior of the probe will be rinsed with distilled water and wiped with clean paper towels. The interior of the probe will be flushed with detergent/distilled water and purged for approximately 30 seconds with 20 psi of ultra-zero grade air, pre-purified nitrogen, or filtered ambient air.

3.3 SAMPLE DESIGNATION AND ANALYSES

The soil gas samples will be "grab" samples analyzed by a portable gas chromatograph in the field or, if available, within a building adjacent to the study area which has a compatible electrical supply. The gas chromatograph develops a chromatogram for each gas sample, which the instrument operator uses to assess the type and concentration of any detected contaminants. The gas sample grid number and ambient air temperature at the time of collection will be recorded in the field log book and on the chromatogram.

4.0 SURFACE SOIL SAMPLING

The objectives of the surface soil sampling are to assess the presence and nature of surface soil contamination at each study area. This information will aid in meeting overall sampling plan objectives. Site area specific background surface soil samples will be collected.

4.1 SAMPLING STRATEGY AND SAMPLE LOCATION

Surface soil sampling and other sampling activities have previously been conducted at some of the study areas being investigated. When appropriate, the findings and results of previous investigations were used in establishing the surface soil sampling strategy at each study area. Surface soil samples will be collected and analyzed as discrete samples.

4.2 SURFACE SOIL SAMPLING METHODS

Surface soil samples will be collected directly with a stainless steel spoon. In some instances (e.g., dense soil) a stainless steel, hand bucket auger may be used to assist in the collection of the samples. Soil samples to be analyzed for VOCs will be collected from a depth of zero to twelve inches below the ground surface. These samples will be transferred directly to the sample container to minimize loss of VOCs from the sample. Other surface soil samples will be collected directly from the ground surface (0-3 inches), below any surface vegetation (leaves, grass, etc.) with a dedicated stainless-steel spoon. All but the sample portion for VOC analysis will be homogenized in a stainless steel bowl prior to being placed into appropriate containers.

Stainless steel spoons and bowls will be dedicated to each sample and will be laboratory decontaminated. Other sampling devices (hand augers) will be decontaminated prior to each use in the field. A geologic and general description (e.g. stains, odors) of each surface soil sample collected will be recorded in a field notebook. Field instrumentation readings (OVA, HNu) from samples will also be recorded in the field notebook.

4.3 SURFACE SOIL SAMPLE DESIGNATION

Surface soil samples will be assigned a designated field identification number which will reference the study area number, sample type, sample location, and sampling date. Below is an example of a surface soil sample identification number:

Example: CC-SS2-082092

where: CC = Coddington Cove Rubble Fill Area
SS = Surface Soil Sample
2 = Sample Location Number
082092 = Sampling Date (August 20, 1992)

5.0 TEST PIT OPERATIONS

The objective of the test pitting program is to physically access and assess the nature of subsurface materials disposed in rubble debris areas. Significant findings of the test pit investigation will be reviewed with representatives of the Navy, EPA, and RIDEM to evaluate the adequacy of the study area exploration program.

5.1 TEST PIT SAMPLING METHOD

Test pit excavation activities will be conducted with a backhoe or trackhoe. Test pits will be excavated to the observed ground water table, or the maximum reach or capability of the backhoe. Information obtained from physical observation of the site (e.g. stressed vegetation, stained soil) and geophysical and/or soil gas surveys will be used to aid in "fine tuning" planned test pit locations, as appropriate.

The test pit samples will be collected directly from the backhoe bucket with a dedicated, decontaminated stainless steel spoon. Samples will be collected from the middle of the bucket, at least three to four inches below the surface of bucket material. The sample matrix will be homogenized (or mixed) in a dedicated, decontaminated stainless steel bowl. However, first the sample aliquot for VOC analysis will be placed directly in an appropriate container prior to mixing the sample in a bowl. A geologic and general description of the sample material will be recorded in a field notebook along with the depth and location from which each sample is collected.

Test pit soil samples will be monitored for the presence of total volatile organic vapors with a flame or photo-ionization detector. Test pit excavations will be photographed and staked for survey purposes. Additionally the size (depth, width and length) of the test pit and depth to observed ground water will be recorded at each location. Test pits will be backfilled upon completion of sampling/characterization or at the end of the day, whichever is first.

5.2 TEST PIT SAMPLE DESIGNATION

Test pit samples will be assigned a designated field identification number which will reference the study area number, sample type, sample location number, test pit sample number, and sampling date. Below is an example a test pit sample identification number:

Example: NC-TP1-02-062592

where:
NC = NUSC Disposal Area
TP = Test Pit Sample
1 = Test Pit Location Number
02 = Test Pit Sample Number
091592 = Sampling Date (September 15, 1992)

6.0 TEST BORINGS

Subsurface test borings will be conducted to aid in assessing the presence and nature of soil contamination at individual sites. Information obtained from the geophysical and soil gas surveys may be used to "fine tune" planned test boring locations at each site. Information obtained from the test boring activities may in turn, be used to "fine tune" any planned monitoring well locations. In instances where test boring findings indicate an ideal location for a well (e.g., high levels of contamination observed in fill or aquifer), the test boring may be used for installation of a ground water monitoring well. The rationale for any deviations to this plan based upon such field observation will be discussed with representatives of the Navy, EPA, and RIDEM prior to implementation of such modifications.

6.1 SAMPLING STRATEGY AND LOCATION

Test borings will be drilled and sampled to aid in assessing subsurface soil characteristics and the nature of soil contamination at individual sites. When appropriate, site background information and the findings and results of previous investigations were used in establishing the test boring plan.

6.2 SUBSURFACE SOIL BORING AND SAMPLING METHODS

Split spoon soil samples will be collected at 2.0-foot intervals from each borehole. Standard penetration tests [ASTM D1586-84 (1984)] will be conducted for every 2.0-foot sampling interval. The physical characteristics of each soil sample will be geologically logged and generally described in a field notebook. General observations which may be described include staining, odors, fill material, and wastes. Soil samples to be submitted for laboratory analyses will be transferred from the split spoon to the sample container with a dedicated stainless-steel spoon. Sampling equipment (e.g., augers, drilling rods, split-spoons) will be decontaminated prior to each use as described in the project Quality Assurance/Quality Control Plan. Split spoon soil samples will be monitored for the potential presence of total VOC vapors with a flame or photo-ionization detector. Measurements of relative VOC concentrations will be taken and recorded from the entire split spoon immediately upon opening. Field observations will be recorded in a field notebook.

To minimize potential future human exposure to contaminated drill cuttings, test borings will be backfilled to within 1.0 foot of the ground surface, after which a cement-bentonite grout will be used to "top-off" the hole. Remaining drill cuttings will be handled as described in the Investigation Derived Waste Plan in Volume I of this Work Plan.

6.3 TEST BORING SAMPLE DESIGNATION

Test boring samples submitted for laboratory analyses will be assigned a designated field identification number which will reference the study area number, sample type, sample location, sample number, and sampling date. Below is an example of a test boring soil sample identification number:

Example: NC-B4-S2-091292

where:
NC = NUSC Disposal Area
B4 = Test Boring Location Number
S2 = Second Sample Interval S-2
091292 = Sampling Date (September 12, 1992)

7.0 MONITORING WELLS/PIEZOMETERS

Monitoring wells will be installed to aid in assessing the nature of ground water contamination. The monitoring wells will also be used to provide geologic information on the aquifer characteristics. Piezometers will be installed to aid in assessing site-specific hydrogeologic conditions. Five separate discussions on the monitoring well/piezometer investigations are presented below concerning the following: well sampling strategy, monitoring well construction details, piezometer construction details, well sampling methods, and the well sample designation plan.

7.1 MONITORING WELL LOCATIONS

Information obtained from initial study area investigation activities (e.g., test borings, soil gas sampling, geophysical surveys) may be used to "fine tune" the final well locations at study areas, as justified by the information.

7.2 WELL BORING, DRILLING AND SAMPLING METHODS

The boreholes for overburden wells will be advanced using 4¼-inch minimum inside diameter (I.D.) hollow-stem augers. Split spoon samples will be collected continuously at 2.0-foot intervals from the well borings to a maximum depth of 20 feet or sampler refusal, whichever is encountered first. Sampler refusal is defined as less than six inches of penetration for 100 blows with a 140 pound hammer falling 30 inches in conformance with ASTM 1586-84. When it is necessary to extend well borings beyond 20 feet and bedrock is not encountered, split-spoon soil samples will be collected at every 5-foot interval or identifiable change in strata. Standard penetration tests [ASTM 1586-84 (1984)] will be conducted for every 2.0-foot sampling interval. The physical characteristics of each soil sample will be visually characterized and geologically described in a field notebook. Split spoon samples will also be monitored with a flame or photo-ionization detector (OVA or HNu). Observations will be recorded in the field notebook.

Soil samples to be submitted for laboratory analyses will be transferred directly from the split spoon to the sample container with a dedicated decontaminated stainless-steel spoon.

Sampling equipment (e.g., augers, drilling rods, split-spoons) will be decontaminated prior to each use.

At study areas where sampler or auger refusal is encountered prior to the water table, a bedrock core will be collected to characterize the bedrock. The monitoring well borehole will be advanced ten feet into the bedrock with two 5-foot, double-tube, Nx rock core barrels. Once the cores are retrieved and opened, a description of the bedrock will be recorded in a field notebook. For those borings which indicate evidence of contamination by observation or field instrumentation bedrock coring will proceed in the following manner; when the boring cannot be advanced with hollow stem augers and sampler refusal is encountered, a casing will be seated and grouted into the bedrock. After allowing the grout material to set up, coring will proceed through the inner casing. Prior to construction of the overburden monitoring well, the open borehole in the bedrock will be backfilled with a bentonite slurry to the top of the bedrock surface and allowed to set.

The final depth of monitoring wells will be assessed by TRC-EC field personnel. Variables to be considered in establishing the final well depth will include material encountered, observed contamination, geologic material, depth to the water table, and study area sampling objectives.

Well boring drill cuttings will be handled in accordance with the Investigation Derived Waste Plan described in Volume I of this Work Plan.

7.3 WELL CONSTRUCTION

Drilling and well construction activities will be subcontracted to a qualified well drilling firm. On-site drilling activities will be conducted under the supervision of a TRC-EC geologist/engineer.

Monitoring well construction specifications for this project include the following:

- Six inch borehole (minimum);
- Two inch inside diameter PVC riser and screen;
- Threaded or press joints only on PVC pipe (no glued joints);
- Silica (quartz) sand backfill to a minimum of two feet above the screened interval;
- Two foot minimum thick bentonite seal above the sand pack;

Portland cement/bentonite slurry (about 6:1 ratio respectively) in the well annulus from the top of the bentonite seal to the surface;

- All casing sealant and drilling fluids will be mixed with potable water;
- Vented well cap; and
- Steel casing with a locking cap will be securely set in cement over the well casing stick up and a minimum of three feet below the ground surface. Wells will be clearly numbered with a permanent identification system (e.g., metal tag) affixed to the well casing or concrete pad. In paved areas, and high traffic areas, wells will be installed with curb boxes constructed at or slightly below grade.

Well screen and riser lengths may vary for each well. Screen lengths for wells intercepting the water table will be a maximum of ten feet, with no more than five feet extending above the water table. The five-foot length of screen above the water table is intended to maintain the water table within the screened interval during seasonal and/or diurnal ground water fluctuations. A ten-foot screen length will be used for deep wells installed below the water table. Well riser lengths will be field-determined so the top of the casing extends approximately one to two feet above the ground surface for wells with stick-up protective casing and approximately four to six inches below grade for wells with flush-mounted curb boxes. The driller and TRC-EC geologist/engineer will maintain accurate written logs of the well construction details.

7.4 PIEZOMETER CONSTRUCTION

Piezometers will be installed at study area locations where ground water is in close proximity to the ground surface (i.e. in wetlands or immediately adjacent to streams). Individual piezometers will consist of 1-1/4 to 2 inch diameter wire wrapped wellpoints which are connected to steel riser pipe with coupling joints. These piezometers will be installed at select locations by hand driving techniques. Piezometers will be installed to a depth determined in the field. However, the final screened interval for piezometers will be determined by a combination of factors including the depth to water, the depth to which the piezometer can be hand driven, and the elevation of water in nearby surface water bodies (streams, ponds, etc.) or monitoring wells.

7.5 WELL DEVELOPMENT

Wells will be developed by the surge block and pump technique. Fine-grained material around the well screen will be drawn into the well and removed by agitating the well water with a surge block and simultaneously pumping water from the well at a low discharge rate. An attempt will be made to develop the wells in a manner which minimizes infiltration of sediment. A centrifugal pump outfitted with ASTM drinking water grade polyethylene tubing will be used for removing the water from the well. To prevent cross-contamination between the wells, the surge block will be decontaminated between each well. At a minimum, the surge block will be decontaminated with non-phosphate detergent and tap water, rinsed with tap water, rinsed with methanol, rinsed with hexane, air dried, and rinsed with tap water and then deionized water. The polyethylene tubing will also be replaced between each well. The dedicated new tubing will be rinsed with deionized water prior to its use. Water produced during well development will be drummed for characterization and analysis.

Should the depth of the well or to ground water prohibit the use of the surge block and pumping technique, an alternative method will be used to develop the well. A suitable pumping device (e.g., submersible pump, Waterra™ hand pump) will instead be placed in the well and used for development. Equipment inserted into the well for development will either be dedicated to that well, or, at a minimum, washed with non-phosphate detergent and tap water, and rinsed with tap water and then deionized water prior to each use.

Ground water extracted from each monitoring well during development will be monitored for the following parameters: pH, temperature, specific conductance, and turbidity. Attempts will be made to develop the well until pH, temperature, and specific conductance have all stabilized and turbidity is $\leq$ 10 NTU's or has stabilized to $\pm$ 10% on successive well volumes (minimum of three well volumes).

7.6 GROUND WATER SAMPLING METHODS

A period of at least two weeks will elapse between well development and ground water sampling. Prior to the initiation of sampling activities, a head space reading (OVA or HNu) for the potential presence of VOC's will be recorded and the water level of each monitoring well will be measured to the nearest 0.01 ft with an electronic water sensing device (Solinist Model

101 or equivalent) and recorded in a field notebook. Down-hole equipment (interface probe, water level indicator, etc.) will be decontaminated with deionized water prior to each use, unless visual observations (e.g., oil, odors) indicate additional decontamination is necessary. Additionally, the possible presence of non-aqueous phase liquids (NAPLs), will be assessed in suspected wells (e.g., the thickness of the free phase material will be determined) prior to sampling with an oil/water interface probe. At a minimum, the interface probe will be decontaminated with non-phosphate detergent, tap water, methanol, hexane, tap water and then deionized water after each use.

Prior to ground water sampling, a minimum of three well volumes will be purged from each well using either a hand-operated bailer, a peristaltic pump (preferred), a centrifugal pump, or a submersible pump. The ground water extracted during purging will be monitored for pH, temperature, specific conductance, and turbidity at a minimum rate of one measurement per well volume. Ground water will be purged until the pH, temperature, and specific conductance have all stabilized and turbidity has stabilized to ± 10% on successive well volumes. Purging rates will be kept below two gallons/minute to avoid over-pumping or pumping the well to dryness. In addition, the well will be purged from the top of the water column down to allow the purging of the entire water column. The well will be sampled within two hours of purging.

Ground water samples will be collected with dedicated/decontaminated teflon bailers. A teflon leader-line approximately 3-feet in length will be attached to the end of the bailer. A polyethylene coated nylon rope will then be attached to the teflon line and used to lower and raise the bailer in the monitoring well. The ground water sample will be collected by slowly lowering the bailer into the well until the bailer is filled with water. Once filled, the bailer will be raised to the surface where the ground water will be transferred to the appropriate sample containers. The order of sample bottle filling is as follows: TCL VOC (immediately upon completion of purging the well), TCL BNA, TCL pesticides/PCBs, and TAL metals, cyanide, and TOC. The teflon bailers will be laboratory-decontaminated prior to use. If free phase materials (NAPLs) are measured prior to sample collection, this fact will be documented and any NAPL will be sampled and analyzed for TCL VOCs and petroleum hydrocarbon fingerprint analysis. The Navy will determine the type and scope of additional investigation(s) needed to assess the nature and extent of free phase materials in subsequent investigations.

The pH, specific conductance, temperature, dissolved oxygen, salinity, and redox potential of the ground water will be measured in the field immediately after sample collection. The pH, temperature, and redox potential will be measured using an Orion Model SA 230 meter, or equivalent. Specific conductance and salinity will be measured with a YSI Model 33 SCT meter, or equivalent. Dissolved oxygen will be measured with a YSI Model 51B Oxygen meter, or equivalent. Field measurements will be recorded in a field notebook. Measurements of pH, specific conductance, temperature, dissolved oxygen, salinity and redox potential will be measured using approved EPA (SW-846, Third Edition) or Standard Methods protocols.

7.7 WELL SAMPLE DESIGNATION

Ground water and well boring soil samples will be assigned a designated field identification number which will reference the study area number, sample type, sample location number, and sampling date. Below are examples of ground water and well boring soil sample identification numbers:

Ground Water Sample:

Example: NC-MW1-092892

where:
NC = NUSC Disposal Area
MW = Monitoring Well Water Sample
1 = Well Number
092892 = Sampling Date (September 28, 1992)

Boring Soil Sample:

Example: NC-B1-S2-092892

where:
NC = NUSC Disposal Area
B1 = Well Boring Soil Sample and Number
S2 = Sample Interval S-2
092892 = Sampling Date (September 28, 1992)

8.0 SURFACE WATER SAMPLING

Surface water samples will be collected from rivers, brooks, ponds, and wetlands adjacent to individual sites to help characterize and identify potential site related impacts on these drainage systems. The locations of study area specific sampling points is provided in the individual study area-specific Work Plans.

8.1 SURFACE WATER SAMPLING METHOD

Surface water samples will be collected directly from the surface water body of interest in appropriate sample containers. Surface water samples will be collected by partially submerging the appropriate sample containers in the water body. Care will be taken to minimize turbulence during sampling. Surface water sampling will start downstream and proceed upstream. Surface water samples will be collected prior to any sediment or biota samples at a particular location.

The pH, specific conductance, temperature, dissolved oxygen, alkalinity, salinity and hardness of the surface water at each sample location will be measured in the field at the time of sample collection. The pH will be measured to the nearest tenth of a standard unit and temperature to the nearest degree Centigrade using an Orion Model SA 230 meter, or equivalent. Specific conductance and salinity will be measured with a YSI Model 33 SCT meter, or equivalent. The dissolved oxygen will be measured with a YSI Model 51B oxygen meter. The hardness will be measured with a HACH digital titrator, or equivalent. Measurements of pH, specific conductance, temperature, dissolved oxygen, salinity, and redox potential will be measured using approved EPA (SW-846, Third Edition) or Standard Methods procedures.

A graduated stake will be driven into the sediments at each surface water sample location (for locations with less than four feet of water) for recording the depth of water at the time of sampling and for future reference in locating the sample location. In addition, precipitation events which occur forty eight (48) hours prior to the surface water measurement will be noted.

8.2 SURFACE WATER SAMPLE DESIGNATIONS

Surface water samples submitted for laboratory analyses will be assigned a designated field identification number which will reference the study area number, sample type, sample location, sample number, and sampling date. Below is an example of a surface water sample identification number:

Example: NC-SW1-080592

where: NC = NUSC Disposal Area
SW = Surface Water Sample
1 = Sample Number
080592 = Sampling Date (August 5, 1992)

9.0 SEDIMENT SAMPLING

Sediment samples will be collected at a specified number of locations at or near each study site. Near and far shore sediment samples will be collected from Narragansett Bay near Study Area 17 the Gould Island Electroplating Shop.

9.1 SEDIMENT SAMPLING METHODS

Sediment sampling locations will be selected based on field observations and results of any previous applicable field testing data. Preference will be given to areas of leachate outbreaks, deposition areas, and to sediments containing organic material as opposed to sand. Near shore sediment samples will be collected with a precleaned two-inch diameter by two-foot long fiberglass hand coring device. Sediment samples will be collected from a depth determined in the field. A one to two foot core will be collected (where possible) at each sediment station to identify the zone of bioturbation. The sediment sample will be collected from within the identified zone of bioturbation. This device will be equipped with a top mounted check valve to prevent sample washout during retrieval through the overlying water column. Far shore samples will be collected using a gravity coring device. Core liners will be constructed of fiberglass or similar material.

In the event that stones or other material precludes effective use of the above sampling devices sediment samples will be collected with a spade and spoon. Sediment cores will not be extracted in the field. Core ends will be screened with a flame or photo-ionization detector for the presence of organic vapors immediately upon collection and all readings recorded. The physical and geologic characteristics of each sediment sample will also be recorded in a field notebook. An attempt will be made to collect sediment samples with greater than 30 percent solids. However, in the event that samples are collected with less than 30 percent solids, an appropriate sample volume adjustment will be made to obtain acceptable analytical results. Sample cores will be stored at approximately 4 degrees Centigrade following collection and VOC screening.

9.2 SEDIMENT SAMPLE DESIGNATIONS

Sediment samples submitted for laboratory analyses will be assigned a designated field identification number which will reference the site number, sample type, sample location, sample number, and sampling date. Below is an example of a sediment sample identification number:

Example: NC-SD1-080592

where:
NC = NUSC Disposal Area
SD = Sediment Sample
1 = Sample Number
080592 = Sampling Date (August 5, 1992)

10.0 BIOTA SAMPLING

Biota samples will be collected from Narragansett Bay near Study Area 17, the Gould Island Electroplating Shop, to assess impacts, if any, of the site on nearby biota (bivalves).

10.1 BIOTA SAMPLING METHODS

A primary objective in sampling for bivalves is to obtain a pool of bivalves representative of the site from which they were collected. Different bivalve collection techniques will be employed depending upon station depth, bivalve species, and environmental conditions at the site. Mussels and hard shell clams will be collected by hand with a stainless steel quahog rake, or with a dredge sampler. An attempt will be made to collect mussels and clams within a twenty foot radius of the specified sample station. A sufficient amount of sample, specified by the analytical laboratory, will be collected to perform the required analyses.

At intertidal sites, bivalve samples will be collected by hand with polyethylene gloves, or other appropriate dermal protection. In water less than one meter deep bivalves will be collected using a stainless steel quahog rake. Clusters of mussels, attached to each other and bottom material by bassal threads, can be pried apart using the tines of the rake.

A dredge sampler will be used to collect bivalves in water deeper than two meters. The dredge is a toothed ship dredge constructed of stainless steel. The dredge bag is constructed of polyethylene mesh.

The target sample size for each individual replicate is 12 bivalves. The ability to collect representative biota samples will be highly dependant on the density of bivalves at the selected locations.

10.2 BIOTA SAMPLE DESIGNATIONS

Biota samples submitted for laboratory analyses will be assigned a designated field identification number which will reference the site number, sample type, sample location, sample number, and sampling date. Below is an example of a biota sample identification number:

Biota Samples:

Example: GI-BT1-080592

where: GI = Gould Island Electroplating Shop
BT = Biota Sample
1 = Sample Number
080592 = Sampling Date (August 5, 1992)

11.0 LAND SURVEYING

Following the completion of field sampling activities at each of the study areas, they will be surveyed by a State of Rhode Island registered surveyor. The physical site features along with the location and elevation of sampling stations (outside of buildings) will be determined in the survey. Each sampling location will be referenced to the State of Rhode Island Grid Coordinate System. Completed wells will be surveyed for elevation of the top of the protective casing, top of the well casing, and the adjacent land surface. Piezometers, if any, will also be surveyed at this time. Elevations will be referenced to a United States Geological Survey benchmark.

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

APPENDIX C
HEALTH AND SAFETY PLAN

STUDY AREA SCREENING EVALUATION WORK PLAN NAVAL EDUCATION AND TRAINING CENTER, NAVAL UNDERSEA WARFARE CENTER NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared for:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December, 1992

TRC
TRC Environmental Corporation

TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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SITE INSPECTION WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

HEALTH AND SAFETY PLAN APPROVALS

TRC Program Manager	Date
TRC Project Manager	Date
TRC Health & Safety Director	Date
Northern Division Representative	Date

SITE INSPECTION WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

PERSONNEL SAFETY - ACKNOWLEDGEMENT FORM

All TRC project personnel are required to make the following statement prior to conducting work at the Naval Education and Training Center and Naval Undersea Warfare Center, Newport, Rhode Island.

I, ______________________________ state that:

1. I have read and fully understand the Health and Safety Plan and my individual responsibilities.

2. I agree to abide by the Health and Safety provisions of this Plan.

____
Signature

____
Date

TABLE OF CONTENTS

Page

TABLE OF CONTENTS, CONT.

TABLE OF CONTENTS, CONT.

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared by TRC Environmental Corporation (TRC-EC) for specific application to the Study Area Screening Evaluation (SASE) investigations for the Naval Facilities Engineering Command (NAVFAC), Northern Division. SASE investigations have been developed for one site located at the Naval Education and Training Center (NETC), and two sites at the Naval Undersea Warfare Center (NUWC) in Newport, Rhode Island. The location of the Newport Naval Base is shown on Figure 1, Site Locus.

This Health and Safety Plan has been prepared to protect worker health and safety during investigation activities at the three sites shown on Figure 2, Study Area Locus Plan. The HASP is intended as an addendum to a March, 1989 Health and Safety Plan prepared in support of a Remedial Investigation prepared by TRC-EC for five separate NETC study areas. Site-specific health and safety information can be found in the study area specific work plans. A copy of this HASP as well as a copy of individual study area work plans will be available on-site during field activities.

Section 2.0 of the HASP describes the anticipated hazards which may be encountered at the study sites. Section 3.0 discusses project staffing, organization and responsibilities. Section 4.0 describes TRC-EC's Corporate Health and Safety program and adherence to regulatory standards. Section 5.0 describes site control measures to be employed at the site to maintain order and minimize chemical and physical hazards to on-site personnel, visitors, and the public. Section 6.0 describes site Health and Safety orientation meetings, and weekly Health and Safety meeting updates. Section 7.0 describes task specific Health and Safety procedures as well as chemical and physical hazards, site monitoring, action levels, personal protective equipment and decontamination and disposal procedures. Lastly, Section 8.0 describes emergency procedures, emergency phone numbers and a map of the shortest route to a hospital.

1.1 PROJECT OBJECTIVES

The objective of this Work Plan is to define the level of investigation planned to assess the presence and nature of environmental contamination at the three study areas. The site investigations will be conducted at each site to assess the presence of any hazardous substances, the nature of any materials disposed, and the potential for releases of contamination. The findings of these SASE investigations will be used to assess the need to perform any further environmental investigations at each site. The three subject sites include:

Study Area Number	Name
4	Coddington Cove Rubble Fill Area
8	NUSC Disposal Area
17	Gould Island Electroplating Shop

The purpose of the HASP is to inform site personnel of the currently known and suspected hazards associated with work at the study sites. All site personnel, including subcontractors, are required to become familiar with and follow provisions of this plan. Although all employees are required to follow the guidelines set forth herein, the safety of site personnel is ultimately the responsibility of the individual and their respective employers. development of this site safety plan is intended to minimize the potential for site related health and safety problems. However, neither the Navy or TRC-EC can definitively insure the safety of any individual on-site. Copies of this HASP will be available to on-site personnel for orientation to anticipated hazards on-site (based on currently available data), as well as the health and safety procedures to be followed during implementation of this program. TRC-EC or NAVFAC cannot be responsible for enforcing provisions of this plan for the health and safety of site workers other than their own employees.

To meet project objectives, field explorations including: radiological, ambient air, combustible gas, soil gas, and geophysical surveys; soil, sediment, surface water, biota, and ground water sampling; test pitting, soil borings, and monitoring well installations will be undertaken as described in the site specific Work Plans provided as Volumes I through III of this Work Plan. Each of these work tasks are summarized below.

1.2 WORK TASKS

This section summarizes field activities proposed at the three study areas. Specific site activities are described in Volumes I through III of the Work Plan. Potential chemical hazards associated with each study area are described in Section 2.1.1 through 2.1.6.

1.2.1 Radiological Survey

Available background information indicates that no radioactive material was disposed at any of the three sites. However, as a precautionary measure, a radiological survey will be conducted at each study area. The survey will be conducted using a scintillation meter (Ludlum Model 19 Micro R Meter, or equivalent). The survey will be conducted in a manner defined for each site in the Work Plan (i.e. grid pattern or walkover). Deviations from normal background readings will be documented and appropriate modifications will be recommended to the HASP should conditions warrant.

1.2.2 Soil Gas Survey

A soil gas survey will be conducted at each of the sites. The objective of the soil gas survey is to assess the potential presence and nature of subsurface VOC vapors. Additionally, the survey will be used to support, and if necessary modify, the levels of personnel protection established in Section 7.0 for subsurface explorations.

1.2.3 Geophysical Surveys

A geophysical survey will be conducted at each of the sites. The objectives of the geophysical surveys will be to assess the presence and nature of conductive and metallic subsurface materials at the sites. The surveys will be conducted in a manner defined for each site in the Work Plan (i.e. grid pattern or walkover). As noted above, survey results may be used to modify levels of personnel protection, if warranted.

1.2.4 Test Pits

Test pits will be completed at the Coddington Cove Rubble Fill Area. The objective of the test pit program will be to asses the nature, type and thickness of fill materials. Test pit activities will be coupled with soil sampling described in the Work Plan to aid in evaluating the presence and nature of subsurface contamination.

1.2.5 Soil Sampling

Soil samples will be collected from each of the sites. Samples will be collected from a variety of locations including test pits, surface soils, and boreholes. Samples will be concentrated in areas identified through historic or survey (soil gas or geophysics) information as potentially containing waste materials. The objective of soil sampling will be to assess the type of soil contamination at each of the study areas. Each sample collected will be screened for the presence of total volatile hydrocarbons with a photoionization and a flame ionization detector.

1.2.6 Surface Water/Sediment/Biota Sampling

Surface water samples will be collected from two of the three sites (Coddington Cove and the NUSC Disposal Area), while sediment samples will be collected from these sites in addition to the Gould Island Electroplating site. Biota samples will also be collected from the Gould Island Electroplating Shop vicinity. The objective of the surface water/sediment and biota sampling program is to assess impacts, if any, of the sites on nearby receptors.

1.2.7 Monitoring Well Installation and Development

Monitoring wells are proposed at two of the three sites (all except the Gould Island Electroplating Shop). The objective of the monitoring well installation program is to assess ground water quality at sites on Aquidneck Island.

1.2.8 Ground Water Sampling

Prior to sampling, each ground water monitoring well will be purged of at least three times the standing volume of water in the well. Ground water samples will then be collected from the newly installed monitoring wells. Ground water sampling procedures are described in the Work Plan.

1.2.9 Land Survey

Following completion of field explorations, the location of test pits, monitoring wells, and sampling points will be established on a site plan. The objective of the survey will be to locate sampling points relative to one another and pertinent site features (buildings, etc.).

2.0 SITE HAZARD SUMMARY

Hazards which may be encountered at this site can be classified into three general categories: chemical, physical, and natural. Chemical hazards are site specific and involve potential exposure to chemical contaminants in soil, ground water, and volatilized components in air. Physical hazards are generally occupationally specific and involve some type of accident. Natural hazards are created by natural environmental circumstances such as weather, poisonous plants, poisonous animals, insect bites, etc.

2.1 CHEMICAL HAZARDS

A review of the available historic information indicates a number of potential contaminants may be present at each of the study areas. Table 1 summarizes suspected contaminants at each of the three study areas. Table 2 provides 1991-1992 Threshold Limit Values (TLVs) or PEL's (whichever is lower) published by the American Conference of Governmental Industrial Hygienists for contaminants which may be present at the study areas. TLVs refer to airborne concentrations of substances to which the average worker is presumed to be able to be exposed without adverse effects. TLVs are established assuming a worker is exposed to the contaminant for a period of eight hours per day, five days per week for a working lifetime of twenty years.

The potential for exposure to site contaminants could result from inhalation, ingestion, or direct contact (skin absorption) with soils or waters contaminated with volatile organic hydrocarbons. Common symptoms of acute exposure to VOCs include headaches, dizziness, nausea, eye irritation, fatigue, loss of coordination, visual disturbances, abdominal pains, and cardiac arrythmia. Chronic exposures to solvents, hydrocarbons, and lead can lead to skin diseases; nervous and respiratory system disorders; kidney, liver, brain, and heart malfunctions; and cancer.

Potential contaminants from former or current activities that may be encountered at each of the study areas are summarized below.

2.1.1 Coddington Cove Rubble Fill Area

The Coddington Cove Rubble Fill Area occupies approximately five to eight acres south of Building 47 adjacent to the Coddington Highway. Available information indicates this area was used for disposal of concrete, asphalt, slate, wood, brush, and small quantities of ash from approximately 1978 until 1982. Based on the suspected disposal of ash materials at the site, chemical hazards may include heavy metals. The disposal of organic debris may also result in natural decomposition products such as methane.

2.1.2 NUSC Disposal Area

The NUSC disposal area occupies an area of one acre or less north of Building No. 1170 and Cunningham Street and south of the Wanumetonomy Golf and Country Club. Available information indicates this area was used for disposal of scrap lumber, tires, wire, cable and empty paint cans for an unspecified period of time. Chemical hazards could include VOCs and heavy metals from paint residues, as well as methane produced from the natural decomposition of organic materials.

2.1.3 Gould Island Electroplating Shop

The Gould Island Electroplating Shop occupies a portion of Building 32 on Gould Island in Narragansett Bay. Building 32 is presently vacant. Available information indicates that electroplating and degreasing operations were conducted in Building 32 during the mid 1940's. These activities were reportedly discontinued after the end of World War II. The location of the disposal of waste materials generated from the electroplating activities were not verified during the IAS. However, the IAS suggests that waste materials and floor drain outfall locations were likely directed to off-shore discharge pipes.

Available information indicates use of hydrochloric and chromic acid, copper and sodium cyanide, sodium hydroxide, nickel sulfate, and degreasing solvents. Based on this information chemical hazards in the form of VOCs, heavy metals, and cyanides are indicated.

2.2 PHYSICAL HAZARDS

Primary physical hazards at the site are those associated with drilling and test pitting activities. Hazards that could be encountered during subsurface explorations include falls and trips, injury from lifting heavy objects, falling objects, eye injuries, head injuries, and pinched or crushed hands and feet. A fire hazard may also be present due to the use of gasoline-powered equipment, and the possible presence of flammable materials in subsurface soils.

2.3 NATURAL HAZARDS

Natural hazards such as weather, poisonous plants, animals, and insects cannot always be avoided. Based on available information and current site conditions, the site safety officer and field personnel shall use their best judgement to avoid these potential hazards.

Natural hazards also include exposure to adverse weather conditions including heat and cold stress.

3.0 STAFF RESPONSIBILITIES

3.1 PROJECT STAFF RESPONSIBILITIES

TRC-EC staff listed below will be responsible for the respective activities listed.

3.1.1 Program Manager

- Holds ultimate responsibility for satisfactory completion of the project.
- Reports status of field activities to the Navy Northern Division Engineer-In-Charge.

3.1.2 Project Manager

- Provides overall project management and control.
- Maintains day-to-day liaison with NETC Environmental Coordinator and subcontractors.
- Notifies NETC Environmental Coordinator of any site emergencies.
- Prepares, reviews, and transmits project documents to the Navy.
- Conducts the initial health and safety site orientations.

3.1.3 Health and Safety Director

- Assists in the development and review of the HASP.
- Provides on-going industrial hygiene support to the Project Manager.
- Reviews and approves significant changes and/or deviations to the HASP.
- Provides consultation to the Project Manager on technical aspects of the HASP and its implementation.

3.1.4 Field Operations Manager

- Coordinates and supervises fieldwork.

- Reports daily progress of fieldwork to the Project Manager.

- Notifies Project Manager of deviations from the Health and Safety Plan.

- Assures that fieldwork proceeds according to Health and Safety Plan requirements.

- Designates On-Site Coordinator (OSC)

3.1.5 On-Site Coordinator (OSC)

- Primary responsibility for notification of and transport of injured field personnel to a hospital in the event of an accident.

- Monitors field investigations to ensure compliance with the approved HASP.

- Recommends modification of the HASP to the Project Manager as soon as practical after it is apparent that the Plan should be modified.

- Keeps non-essential personnel outside study zone boundaries. Logs in the field notebook personnel who enter into the study zone.

- Appoints alternate on-site coordinator on an as needed basis.

- Uses appropriate portable field instruments to monitor site conditions during investigatory activities.

- Maintains a log of field activities, monitoring data, and site meetings.

3.1.6 On-Site Coordinator - Alternates(s)

- Assumes all functions and responsibilities of the OSC in his/her absence.

3.1.7 Subcontractors

- Immediately notify the Field Operations Manager or On-Site Coordinator of hazardous or potentially hazardous conditions or environments that are not addressed or not adequately addressed in the HASP.

- Conduct work in a safe manner.

4.0 REGULATORY REQUIREMENTS AND PERSONNEL QUALIFICATIONS

To be authorized for field explorations, TRC-EC field personnel and subcontractor field personnel (drilling and test pit contractors) must meet the minimum requirements described in these subsections. It is not necessary that the analytical laboratory or survey subcontractor meet these requirements since they will not be performing site-invasive procedures.

Documentation of the requirements described below will be maintained by TRC for TRC-EC personnel involved in field activities. Subcontractors are responsible for maintaining the required documentation for their field personnel.

4.1 MEDICAL MONITORING

In compliance with OSHA medical monitoring regulations (29 CFR 1910.120), field supervisory personnel and field personnel shall have received an examination by a licensed physician. The most recent exam shall have been received within the 12-month period proceeding this work, and each employee shall have been determined by the attending physician to be physically able to perform the work and to use respiratory and other protective equipment as required for field investigations.

4.2 HEALTH AND SAFETY TRAINING

Field personnel shall have received training and/or experience which, at a minimum, satisfies the OSHA regulations for hazardous waste and emergency response (29 CFR 1910.120).

4.3 RESPIRATOR TRAINING

All personnel who enter the Exclusion Zone shall have completed a respiratory protection program which, at a minimum, satisfies the OSHA regulations (29 CFR 1910.134). This program shall include: 1) instruction in the proper use and limitations of respirators; 2) proper fitting of personnel for a respirator, using a qualitative or quantitative fit test method; and 3) teaching personnel how to conduct a positive and/or negative pressure fit test. The respirator which is used to fit test personnel will be individually assigned and available for site work.

TRC-EC provides respiratory protection to employees involved in activities at work locations where the presence of respirable hazards is known or suspected.

Field staff assigned to this project shall be capable of using and inspecting a cartridge respirator. Prior to the commencement of site explorations, field staff will be issued a respirator. The maintenance of that respirator shall be the responsibility of the individual. OSHA requires that respirators be inspected both before and after use and that respirators not used routinely shall be inspected after use and at least monthly. At the time the respirator is issued, the individual receiving it shall test the fit (qualitatively), and inspect the gaskets, exhalation valve, face shield, head straps, and cartridges.

Individuals are responsible for cleaning/disinfecting their respirators. Acceptable procedures include washing using detergent/disinfectant in warm water and rinsing or air drying in a clean place. Respirators will be used on a study area specific basis as described in Section 7.0.

5.0 SITE CONTROL

The purpose of the site control measures discussed in this Section are to maintain order at the site and to minimize chemical and physical hazards to on-site personnel, visitors, and the public.

5.1 SITE ACCESS

The site consists of three study areas located within the confines of the Newport Naval Base. In general, physical access to parcels comprising the areas of exploration are restricted via access to the Newport Naval Base and access to the study areas by way of chain-link fencing. Access to Gould Island is limited by its location within Narragansett Bay. General site access may be evaluated from the site plans provided in Volumes I through III of the Work Plan.

5.2 EXCLUSION/DECONTAMINATION ZONES

During subsurface explorations (soil borings, test pits), the OSC or alternate shall establish an exclusion zone around exploration equipment (drill rig, excavator). The exclusion zone will be demarcated using safety cones and caution tape. The OSC or alternate will be responsible for keeping nonessential personnel outside the exclusion zone boundaries. In the event that visitors or unauthorized personnel are present during field activities, the OSC or alternate shall verbally request that they maintain a safe distance outside of the area marked by the caution tape and safety cones. Prior to entering the exclusion zone, site personnel shall have donned the proper personal protective equipment (PPE) for expected site conditions, as outlined in Section 7.0, or as determined by the OSC or alternate.

A contamination reduction station, or decontamination area, shall be established adjacent to the exclusion zone. The contamination reduction zone will be established at the upwind side of the exclusion zone and will consist of a taped off area adequate in size to comfortably contain decontamination equipment. Personnel exiting the exclusion zone shall undergo appropriate decontamination, if required by the task-specific procedures described in Section 7.0.

Study area specific exclusion and contamination reduction zones are discussed in Volumes I through III of the Work Plan. Disposal of investigation derived waste materials is described in the Project Introduction to this Work Plan.

5.3 COMMUNICATIONS

Communication into or out of the Exclusion Zone will be accomplished by voice. Communication between sites will be accomplished with a mobile phone. When moving drilling equipment, the driller's helper shall serve as signal person. Signal persons shall use standard hand signals to instruct the equipment operator left, right, forward, reverse and stop.

6.0 GENERAL HEALTH AND SAFETY WORK PRECAUTIONS

6.1 HEALTH AND SAFETY SITE ORIENTATION

All site personnel shall be required to read this HASP and attend the Health and Safety Site Orientation meeting. Documentation of attendees will be maintained as part of project records. The HASP will accompany field personnel to each study area and shall be maintained at a location known to each individual working on-site.

The Project Manager or OSC will conduct a health and safety site orientation prior to the initiation of field activities. The orientation will cover all aspects of this HASP. Particular emphasis will be placed on a review of potential site contaminants and their potential health effects; accident prevention; safe work procedures; precautionary measures; use of personal protective equipment; and emergency response procedures. All field staff are required to attend. The orientation will be documented on the Safety Meeting Summary Form described below.

6.2 HEALTH AND SAFETY BRIEFINGS

The OSC or alternate will conduct a Health and Safety Briefing on a routine basis. Topics to be covered include personal protective equipment, personnel and equipment decontamination procedures, accident prevention, and any modifications or amendments to the Health and Safety Plan. All field staff are required to attend. A Safety Meeting Summary Form documenting personnel attending each meeting will be maintained in project files.

7.0 TASK-SPECIFIC HEALTH AND SAFETY PROCEDURES

7.1 GENERAL

The following general health and safety procedures will be employed for work conducted at each of the three sites.

7.1.1 Chemical and Physical Hazards

The activities which do not involve subsurface activities (radiological, soil gas and geophysical, and location surveys) could result in the exposure of workers to contaminated surface soils or vapors. Such an occurrence can lead to worker exposure via inhalation or permeation through the skin (skin absorption). However, in general, non-invasive activities do not require direct contact with site soils and/or waters, and therefore exposures are anticipated to be minimal.

7.1.2 Site Monitoring

The OSC shall use an HNu PI-101 (or equivalent) photoionization detector (PID) with either a 10.2 or 11.7 electron volt lamp (or flame ionization detector - FID, OVA 128, or equivalent) to monitor organic vapors in the breathing zone at the upwind boundary of the Exclusion Zone at the beginning of each day, to establish a daily background reading.

The federal regulation 20 CFR Part 1910.120 (h)(2-3) indicates air monitoring is required upon initial entry, and periodic monitoring shall be conducted when the possibility of an immediately dangerous to life and health (IDLH) condition exists or when there is an indication that exposures may have risen over permissible or published limits since prior monitoring. The air monitoring program conducted on site is intended to be consistent with these requirements.

7.1.3 Action Levels

All field work will begin in personal protective gear as defined in the individual site Work Plans provided as Volume I through III. Based on positive PID readings in the breathing zone, or site conditions, the OSC shall upgrade Personal Protective Equipment (PPE) requirements as described below.

The following action levels are based on PID breathing zone readings:

- 0 to 1 PID unit above background: Level D
- 1 to 5 PID unit above background for longer than one minute:

  Modified Level D
- 5 to 25 PID units above background: Level C
- 25 PID units or greater: discontinue operations. Make arrangements to continue work in Level B protective equipment or use Level B to retrieve/demobilize equipment.

The OSC may also make the decision to upgrade the PPE requirements, even if positive PID readings are not noted. This decision will be based on site conditions including visual or sensory observation of soil or ground water contamination, or other site hazards.

7.1.4 Personal Protective Equipment (PPE)

This section contains specific provisions for the use of Personnel Protective Equipment (PPE). It shall be the responsibility of the OSC to make the determination of the level of PPE to be used by personnel within the Exclusion Zone. The decision of the OSC will be based on site monitoring (Section 7.1.2), action levels (Section 7.1.3), knowledge of the site, and observed site conditions. Changes affecting the level of PPE defined in the HASP will be at the direction and approval of the TRC-EC Project Manager and/or TRC-EC Director of Health and Safety, except in the case of an emergency during which time it will be the responsibility of the On-Site Coordinator to modify PPE levels.

The following is a discussion of the anticipated levels of personnel protection based upon historical information and the findings of the Phase I RI.

Level D protection shall be used at the start of most field work. Level D protection shall include use of the following items:

- work clothes;
- hard hat;
- work boots; and
- chemical protective gloves when collecting soil and water samples (solvex/nitrile).
- inner glove liners (latex/vinyl)

Level D protection may also include the use of a polycarbonate faceshield, attached to the hard hat, in the event that potential splash conditions are present. Splash conditions are most likely to be present during decontamination of heavy equipment. Use of the splashguard shall be at the discretion of the OSC.

A Modified Level D, which includes Level D plus additional PPE (e.g., tyvek, boot covers), will be during subsurface investigation activities (drilling, test pits).

An upgrade to Level C may be necessary if the concentration of VOCs detected in the breathing zone of the workers exceeds the action level of 5 PID units discussed in Section 7.1.3, or if warranted by other site conditions. Level C protection will include all of the PPE required for Modified Level D plus appropriate respiratory protection. The specific respirator to be used for Level C protection shall be a NIOSH-approved respirator with compatible cartridges. Respirator cartridges will be changed at the first sign of break through, or daily at a minimum, when in use.

It is anticipated that protective Level D or Modified Level D will be appropriate for carrying out most work tasks related to this project. A sufficient inventory of necessary equipment will be maintained on-site to provide these levels of protection for all site personnel who must work within the Exclusion Zone.

7.1.5 Decontamination

Decontamination procedures are described in the Work Plan.

Upon leaving the Exclusion Zone, personnel must undergo appropriate decontamination. The nature of the decontamination requirements will depend on the nature of the work conducted and whether immediate re-entry into the Exclusion Zone is planned, or if complete egress from the Exclusion Zone is intended. The decontamination requirements will also depend on the level of protection used within the Exclusion Zone and the suspected degree of contamination. This area will be located immediately outside the access opening of the Exclusion Zone on its apparent upwind side. This area shall contain the decontamination stations necessary to allow rest breaks and respirator cartridge changes (if appropriate), as well as for complete decontamination as required for food and beverage breaks, or exiting the work area. Periodic air monitoring will be conducted in the contamination reduction zone (decontamination area) when this area is used.

7.1.6 Field Generated Waste Disposal

Disposal of investigation derived waste (IDW) such as PPE equipment (e.g., tyveks, gloves) generated during site activities will be conducted as described in the approved 1989 Remedial Investigation Work Plan.

7.2 MEDIA SAMPLING

7.2.1 Chemical Hazards

Media sampling activities include collection of: surficial soil, subsurface soil, sediment, biota, surface water, and ground water samples. These activities may result in the exposure of workers to potentially contaminated soils and ground water, washwater from decontamination of personal protective equipment, and vapors released from either media. Such an occurrence can lead to worker exposure via inhalation, ingestion, and permeation through the skin (skin absorption).

7.2.2 Site Monitoring

The OSC shall use a PID or FID to:

A. Monitor organic vapors above each soil sampling point or observation well prior to sampling.
B. The OSC shall monitor the workers breathing zone continuously during active sampling activities.

Other monitoring equipment will include an oil/water interface probe to measure free-product in the well, and water quality instrumentation. The interface probe will be used to gauge the thickness of any free-product in monitoring wells.

If floating products is observed:

a) the air monitoring frequency will be increased, and
b) a change, if necessary, to the appropriate PPE will occur.

7.2.3 Action Levels

Unless otherwise determined by OSC, modified Level D protection shall be used for media sampling tasks. Based on positive PID readings in the breathing zone or site conditions, the OSC shall upgrade Personal Protective Equipment (PPE) requirements.

Action levels to be used for media sampling activities are outlined in Section 7.1 above.

7.2.4 Personal Protective Equipment (PPE)

Based on site conditions and action levels described in Section 7.1, the OSC shall upgrade personal protective requirements commensurate with site hazards. The OSC may also make the decision to upgrade the PPE requirements, even if positive PID readings are not noted. This decision will be based on site conditions including visual or sensory observations of ground water contamination. In particular, the presence of free product or other contaminants in ground water, soil, or sediment may require an upgrade of PPE requirements.

7.2.5 Exclusion Zone

In recognition of the increased risk to workers of exposure to contaminated soils or ground water an Exclusion Zone of approximately twenty five (25) feet from sampling activities will be established. Nonessential personnel shall be prohibited from entering the Exclusion Zone.

Monitoring results will be considered when establishing exclusion zone boundaries. In general, if elevated readings are encountered, the exclusion zone will be enlarged and if no detectable readings are encountered the exclusion zone will remain as described above.

7.3 SUBSURFACE EXPLORATIONS

7.3.1 Chemical and Physical Hazards

Subsurface exploration activities include completion of test pit and boring activities. These activities may results in the exposure of workers to potentially contaminated soils and ground water, washwater from decontamination of personal protective equipment, and vapors released from either media. Such an occurrence can lead to worker exposure via inhalation, ingestion, and permeation through the skin (skin absorption).

7.3.2 Site Monitoring

The OSC or designee shall use a PID or FID to:

A. Monitor organic vapors in the breathing zone at the upwind boundary of the Exclusion Zone at the beginning of each day, to establish a daily background reading.

B. Monitor organic vapors in the worker's breathing zone during active subsurface explorations.

C. Monitor the workers breathing zone at fifteen-minute intervals or continuously during active subsurface explorations, if elevated levels of organic vapors are detected.

D. Monitor downhole organic vapors during drilling activities.

Other monitoring equipment will include an explosivity/oxygen meter to monitor ambient air for explosive vapors and oxygen content. If elevated PID/FID readings are detected in the breathing zone the O_2/explosimeter will be used to measure downhole vapors to assess the potential presence of explosive conditions.

7.3.3 Action Levels

Action levels to be used for site investigation activities are outlined in Section 7.1 above. Additional action levels for the explosivity/oxygen meter are as follows:

A. If airborne concentrations of flammable vapors exceed 10 percent of the lower explosive limit (LEL), no ignition sources will be permitted in the area.

B. If ambient conditions exceed 25 percent of the LEL at a distance of one foot from the source, or ten percent at a distance of two feet or greater, then site operations will be halted and appropriate corrective actions (upgrade of PPE, or abandonment of the exploration) will be taken.

7.3.4 Personal Protective Equipment (PPE)

Based on site conditions and action levels described in Section 7.1 above, the OSC shall upgrade or downgrade, personal protective requirements commensurate with site hazards. The OSC may also make the decision to upgrade the PPE requirements, even if positive PID requirements are not noted. This decision will be based on site conditions including visual or sensory observations of potential contamination.

During initial subsurface exploration activities and well installations, an upgrade to Modified Level D protection will be required. Necessary equipment for Modified Level D protection will include Level D plus the items listed below:

- Chemically resistant boots, PVC or rubber overboots, or disposable boot covers;
- Tyvek or equivalent jump suit (with ankles and wrists duct taped;
- chemical-protective gloves (solvex/nitrile);
- inner glove liners (latex/vinyl).

If odorous soils are detected during subsurface explorations the following procedures will be employed:

A. if PID or FID readings of auger spoils are consistently above 5 PID units the air monitoring frequency will be increased; and,

B. a change, if necessary, to the appropriate PPE will occur.

7.3.5 Exclusion Zone

In recognition of the increased risk of physical injury and exposure to chemical contaminants, an Exclusion Zone of a minimum of approximately 25 feet in radius shall be established around exploration equipment (i.e. drill rig, backhoe). Nonessential personnel shall be prohibited from entering the Exclusion Zone. All personnel entering the Exclusion Zone will be required to wear appropriate personal protective equipment.

8.0 EMERGENCY RESPONSE

8.1 EMERGENCY INFORMATION

A list of emergency phone numbers will be maintained at individual study areas during active investigation activities. In addition, a copy of this HASP will accompany field personnel to each study area and shall be maintained at a location known to each individual working on-site.

The Newport Hospital is the nearest medical facility. A map with a suggested route to the hospital is provided along with emergency phone numbers in the individual site Work Plans provided as Volumes I through III of the Work Plan. The Newport Hospital will accept and treat (to the extent it is capable) workers exposed to various suspect substances or physically injured at the project site.

In the event of a site emergency, the OSC or alternate shall evacuate site personnel to a safe area and then contact the appropriate authorities listed above. As soon as practical, after contacting the authorities and ensuring the safety of site personnel, the OSC shall contact the TRC-EC Project Manager.

8.2 GENERAL PROCEDURES

An OSHA approved first aid kit, eye wash bottles, and a fire extinguisher rated for class A, B and C fires will be present within or near the Exclusion Zone during subsurface boring explorations. An emergency body flushing facility has been determined to be unnecessary based on the hazards present and the nature of worker activity. It shall be the responsibility of the OSC to make a determination as to the proper response for a particular emergency. As soon as practical after emergency response, the OSC shall brief the Project Manager as to the nature of the incident, and response actions taken. The OSC, with the assistance of health and safety support staff, shall evaluate the site conditions and make a determination regarding any measures that could be taken in the future to prevent incidents of a similar nature from being repeated. The Project Manager shall notify the NAVFAC Project Officer regarding site emergencies.

8.3 EMERGENCY RESPONSE PLAN - SPECIFIC INCIDENTS

8.3.1 Chemical Exposures

Inhalation

A. If site personnel experience symptoms suggesting exposure to toxic chemicals (light-headedness, dizziness, headache, nausea, shortness of breath or burning sensation in the mouth, throat or lungs), the person should be immediately escorted from the contaminated environment to fresh air.

B. If unconscious, the victim should be removed from the contaminated area immediately and brought to the nearest hospital. Rescuers shall wear appropriate Personal Protective Equipment during rescue.

C. If the victim is no longer breathing, he/she shall be moved away from the contaminated area. Immediate mouth-to-mouth resuscitation or some alternate form of effective artificial respiration shall begin.

D. If the victim has no pulse, he/she shall be moved away from the contaminated area and cardio-pulmonary resuscitation (CPR) should begin immediately. It may be necessary for the victim to receive artificial resuscitation and CPR simultaneously.

Should any of the above scenarios be encountered, emergency medical attention/advice must be obtained immediately. The TRC-EC Project Manager should be notified of the situation and the affected individual(s) status as soon as practical.

Skin Exposure

If there is skin contact with toxic or potentially toxic chemicals, the skin should be washed with copious amounts of soap and water. If clothing is contaminated, it should be removed immediately and the skin washed thoroughly with running water. All contaminated parts of the body should be thoroughly washed. It may be necessary to wash repeatedly.

Ingestion

If site personnel ingest known toxic chemicals, or suspected contaminated material, obtain medical attention immediately.

Eyes

If foreign matter should get into the eyes they should be flooded with water so that all surfaces are washed thoroughly. Washing should be continued for at least fifteen minutes. Medical attention should be obtained immediately.

8.3.2 Injury of Personnel

At a minimum, one person on site will be trained in Standard Red Cross First Aid. In the event of an emergency, this person will administer appropriate first aid and arrange transportation for injured personnel to the designated medical facility, if necessary. This person will evaluate the site conditions to determine if the causal hazard still exists. Site personnel shall not re-enter the Exclusion Zone until the cause of the injury is determined, and the Exclusion Zone is designated safe to re-enter.

8.3.3 Fire/Explosion

In the event of a fire or explosion, the OSC shall alert the NETC Fire Department by calling from a phone nearby the affected area. All personnel shall move to a safe distance from the involved area. The OSC shall make a determination regarding the severity of the fire, and whether site personnel shall attempt to extinguish it. Fires shall not be fought by site personnel if an explosion hazard is present or if a large fire is present on this site.

- TABLES -

APPENDIX C
Health and Safety Plan

TABLE 1	*SUSPECTED STUDY AREA CONTAMINANTS*
TABLE 2	*TLV/PELs*

TRC

TABLE 1

SUSPECTED STUDY AREA CONTAMINANTS
NETC/NUSC SASE INVESTIGATION

Study Area No. & Name	Suspected Contaminants
4 - Coddington Cove Rubble Fill Area	Heavy Metals, Methan
7 - Tank Farm One	Volatile Organic Compounds (VOCs), BNAs, Lead
8 - NUSC Disposal Area	Volatile Organic Compounds, Heavy Metals, Methan
10 - Tank Farm Two	Volatile Organic Compounds, BNAs, Heavy Metals
11 - Tank Farm Three	Volatile Organic Compounds, BNAs, Heavy Metals
17 - Gould Island Electroplating Shop	Heavy Metals, VOCs, Cyanide

TRC

TABLE 2

TLV/PELs
NETC/NUSC SASE INVESTIGATION

<u>Compound</u>	<u>TLV-TWA</u>[1] ppm	<u>PEL</u>[2] ppm
Benzene[3]	10	1
Ethyl Benzene	100	100
Gasoline	300	not listed
Naphthalene	10	10
Toluene[3]	100	100
Xylenes	100	100

Notes:

1. TLV-TWA indicates a Threshold Limit Value-Time Weighted Average as listed in the 1991-1992 Threshold Limit Values publication by the American Conference of Governmental Industrial Hygienists (ACGIH). This value is the time-weighted average concentration for a normal 8-hour work-day and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

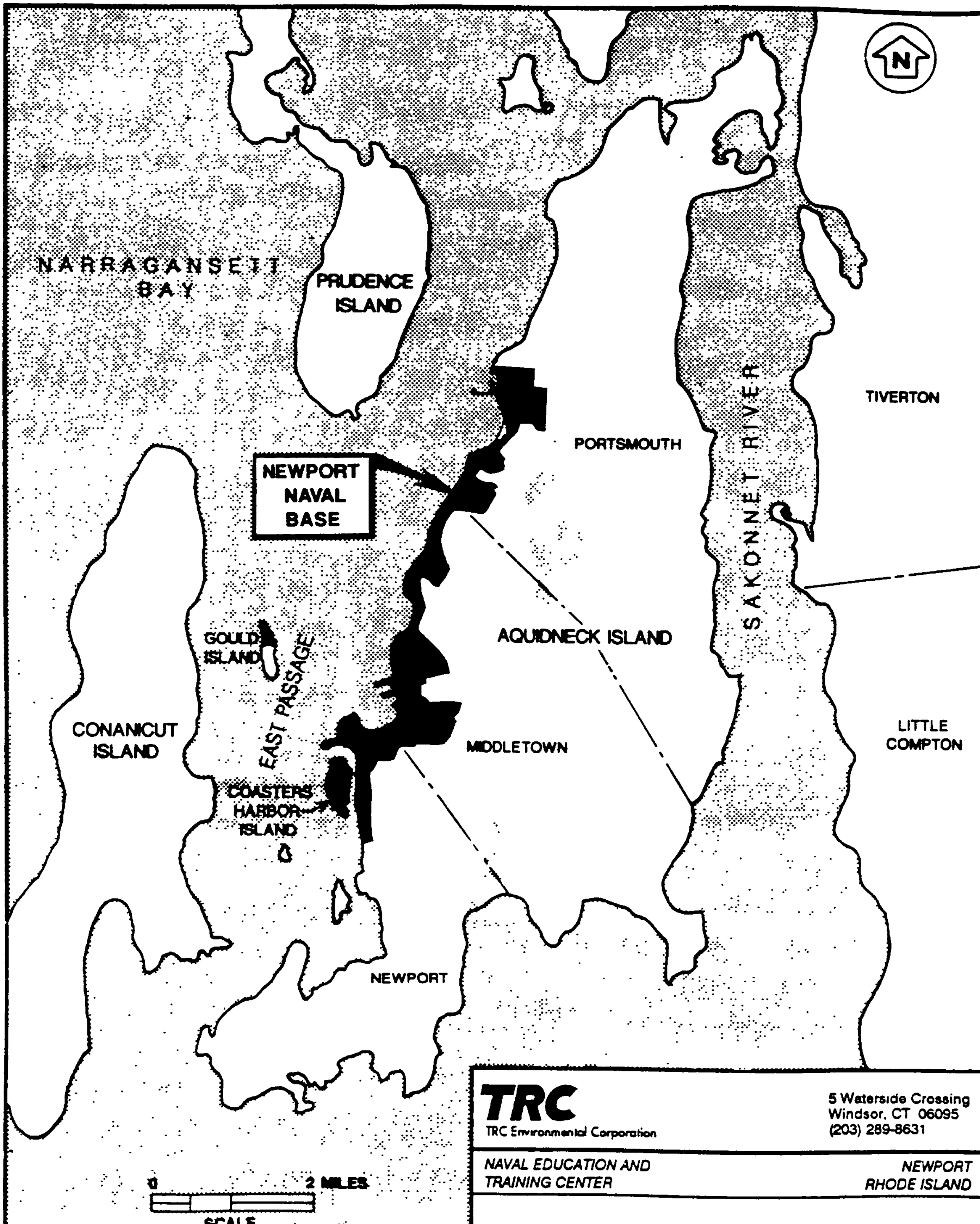
2. PEL indicates the Permissible Exposure Limits as listed in the June, 1990 NIOSH Pocket Guide to Chemical Hazards. PELs are time-weighted average concentrations that must not be exceeded during any 8-hour work shift of a 40-hour work week.

3. Notice of intended changes for 1991-1992 include revision of the following TLV skin exposures for benzene (0.1 ppm) and toluene (50 ppm), given that these substances are listed as category A1 Confirmed Human Carcinogens.

-FIGURES-

APPENDIX C
Health and Safety Plan

TRC



SOURCE: INITIAL ASSESSMENT STUDY
(ENVIRODYNE, 1983)

TRC
TRC Environmental Corporation

5 Waterside Crossing
Windsor, CT 06095
(203) 289-8631

NAVAL EDUCATION AND TRAINING CENTER — *NEWPORT RHODE ISLAND*

FIGURE 1.

SITE LOCUS

Date 12/92	Drawing No 12773-Q41

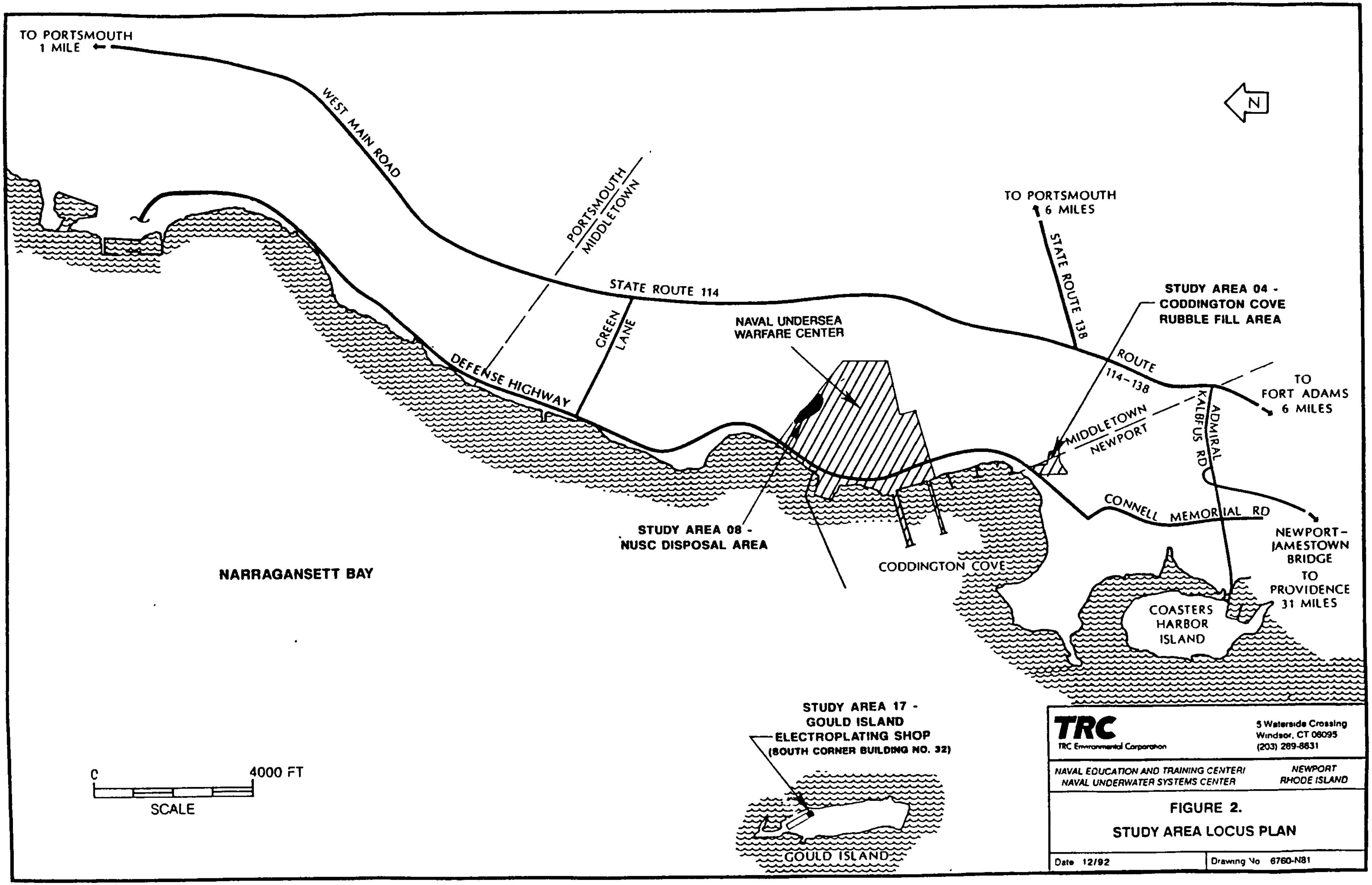


FIGURE 2.
STUDY AREA LOCUS PLAN

U.S. DEPARTMENT OF NAVY
INSTALLATION RESTORATION PROGRAM

APPENDIX D
QUALITY ASSURANCE/QUALITY CONTROL PLAN

STUDY AREA SCREENING EVALUATION
WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

Prepared by:
TRC Environmental Corporation
Windsor, Connecticut

Prepared For:
Northern Division - Naval Facilities
Engineering Command
Lester, Pennsylvania

December 1992

TRC
TRC Environmental Corporation

TRC-EC Project No. 6760-N81-100
Contract No. N62472-86-C-1282

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QUALITY ASSURANCE/QUALITY CONTROL PLAN (QA/QC PLAN) APPROVAL SHEET

STUDY AREA SCREENING EVALUATION WORK PLAN
NAVAL EDUCATION AND TRAINING CENTER
NAVAL UNDERSEA WARFARE CENTER
NEWPORT, RHODE ISLAND

December 1992

Approved by:	TRC-EC Project Manager	Signature	Date
Approved by:	TRC-EC QA Officer	Signature	Date
Approved by:	Laboratory QC Coordinator	Signature	Date
Approved by:	Engineer-In-Charge Northern Division Naval Facilities Engineering Command	Signature	Date
Approved by:	Northern Division QA Officer	Signature	Date
Approved by:	NETC Environmental Coordinator	Signature	Date

TRC

TABLE OF CONTENTS

TABLE OF CONTENTS

(continued)

TABLE OF CONTENTS

(continued)

LIST OF TABLES

TABLE

LIST OF FIGURES

FIGURE

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Quality Assurance/Quality Control Plan (QA/QC Plan) has been developed by TRC Environmental Corporation (TRC-EC) for use in conjunction with sampling activities at the Naval Education and Training Center (NETC) and Naval Undersea Warfare Center (NUWC) in Newport, Rhode Island. The sampling program builds on information from previous studies conducted at NETC and NUWC under the Navy Assessment and Control of Installation Pollutants (NACIP) program. Previous site studies included an Initial Assessment Study (IAS) conducted in 1983, and the first phase of the NACIP Confirmation Study procedure, the Verification Step study, which was completed in 1986, and the Phase I Remedial Investigation which was completed in 1991.

Navy policy calls for following EPA guidance and procedures while conducting investigations and remedial action at all Navy waste sites. The specific tasks outlined in the current Navy Installation Restoration (IR) Program are consistent with EPA guidance, and provide a structure for conducting an RI/FS based on the National Contingency Plan (NCP). The work plan for the Study Area Screening Evaluations (SASE) is designed to assess the presence and nature of environmental contamination at three different study areas located on the NETC/NUWC. The sampling program is designed to meet applicable guidance for Superfund, RCRA, and the Navy IR program.

The QA/QC Plan serves as a controlling mechanism during field sampling, sample laboratory analysis, and data validation to ensure data collected are valid, reliable, and legally-defensible. The QA/QC Plan outlines the organization, objectives, and QA/QC activities which will ensure achievement of desired data quality goals.

1.2 NETC/NUWC Description

The Naval Education and Training Center (NETC) and Naval Undersea Warfare Center (NUWC) are located within the Newport Naval Base, which encompasses approximately six miles of the western shore of Aquidneck Island, Newport County, Rhode Island. Aquidneck Island is comprised of three towns; Newport, Middletown, and Portsmouth. A map of the area is provided as Figure 1. The NETC serves as a training facility and provides logistic support for the Newport Naval Base. The NETC occupies approximately 1,063 acres of land. NUWC is the principal Navy research, development, test and escalation center for warfare and weapons systems. NUWC occupies approximately 191 acres within NETC. The location of the three individual study areas within the Newport Naval Base are shown on Figure 2.

1.3 Previous NETC/NUWC Investigations

Under the NACIP program, an Initial Assessment Study (IAS) was completed by Envirodyne Engineers in March 1983. The IAS identified sites where contamination from past waste disposal or handling practices may pose health or environmental risks. The IAS recommended further investigation of six of the eighteen sites identified.

The Confirmation Study represented the second phase of the NACIP program. The Confirmation Study was completed in May 1986 by Loureiro Engineering Associates, Inc. Review of Confirmation Study results by the Navy and RIDEM provided a list of five sites to be addressed by a phase I RI/FS Work Plan. Phase I investigations were completed at the five RI sites in 1991.

1.4 Current Site Investigations

Study Area Screening Evaluations (SASEs) will be conducted at three study areas at the Newport Naval Base. One of the study areas is located at the NETC and the remaining two study areas are located at the NUWC within the Newport Naval Base, Newport, Rhode Island. The three areas, identified by study area number and name, (IAS, 1983) are as follows:

- Study Area 04 - Coddington Cove Rubble Fill Area
- Study Area 08 - NUSC Disposal Area
- Study Area 17 - the Gould Island Electroplating Shop

The planned site-specific field investigation activities are presented in Volumes I through III of this Work Plan.

1.5 Project Scope

An objective of this work plan is to define the level of investigation necessary to assess the presence of environmental contamination at three study areas on the Newport naval Base and to obtain sufficient data to identify sites posing threats to human health and the environment. The findings of the screening evaluations will determine the need to perform any further environmental investigations at each site.

The field activities and the associated sample matrices analyses for the three study areas at NETC/NUWC are discussed in this Work Plan. The sample program makes extensive use of Target Compound List (TCL) and Target Analyte List (TAL) analyses using EPA-CLP protocols, as defined in the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; revised July 1991, and in the USEPA CLP SOW for Inorganic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; revised September 1991. These EPA CLP requirements will be followed during this study. Naval Energy and Environmental Support Activity (NEESA) guidance (Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, NEESA 20.2-047B, 1988) for Level D analyses and data validation will also be followed by the laboratory and data validator. Where EPA-CLP protocols and NEESA guidance differ, the more stringent requirements will be followed. At a minimum, the most current CLP SOWs will be adhered to by the laboratory.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Introduction

This project will be largely performed by TRC-EC. Project review will be performed by a Technical Review Committee assembled by the Northern Division. The names and addresses of select individuals involved in the project review and oversight appear below.

U.S. Navy

- Northern Division Code 1823
  Naval Facilities Engineering Command
  10 Industrial Highway, Mail Stop #82
  Lester, PA 19113

  Mr. Francisco LaGreca, P.E., Engineer-In-Charge
  (215) 595-0567

- Naval Education and Training Center
  Public Works Dept., Bldg. 1
  Newport, RI

  Ms. Rachel Marino
  (401) 841-3735

TRC-EC

- 5 Waterside Crossing
  Windsor, CT 06095

  Mr. Robert C. Smith, P.E., Program Manager
  Mr. James Peronto, Project Manager
  (203) 289-8631

Rhode Island DEM

- Air and Hazardous Materials Division
  291 Promenade Street
  Providence, RI 02908

  Mr. Paul Kulpa
  (401) 277-2797

U.S. EPA

Region I
Federal Facilities Section
90 Canal Street, 2nd Floor
Boston, MA 02203

Mr. Andrew Miniuks, Remedial Project Manager
(617) 573-9614

Figure 3 presents the organizational chart for the NETC/NUWC SASE project. The responsibilities of TRC-EC's Project Manager and QA/QC staff are briefly described below.

2.2 Project Manager's Responsibility

The TRC-EC Project Manager will provide overall direction to the project team, and will be held responsible for successful project completion. The Project Manager will be the primary contact for the Northern Division's Engineer-In-Charge (EIC).

2.3 QA Manager's Responsibility

TRC-EC's Corporate QA Manager will be the responsible Quality Assurance Officer for this project. The QA Manager reports independently to the Corporate President and, hence, has full authority to act independently from the technical line management structure. He will serve as TRC-EC's primary contact with the Northern Division's QA staff, if so requested by the EIC. He will monitor compliance of the project with the QA/QC Plan, and perform any necessary performance or system audits.

The TRC-EC QA Manager will initiate and monitor any necessary formal corrective actions. He will assist in preparing QA/QC project summaries for the SASE Report, including analysis of precision, accuracy, and completeness of data collected.

2.4 Field QC Coordinator's Responsibilities

A Field QC Coordinator will be selected for this project. The Field QC Coordinator will work with the field team in preparing for the sampling events, and also during the field work.

He or she will be on site to ensure required QC procedures are followed for sample collection and handling; will initiate informal and/or formal corrective actions, as necessary; and will maintain and report QC records and results to the TRC-EC Project Manager and QA Officer. The QC field coordinator will also serve as the QA/QC Manager for the project. This person will be responsible for ensuring all analytical deliverables have been received and subsequently validated in accordance with this QA/QC Plan.

2.5 Laboratory QC Coordinator

The analytical laboratory selected for this project, a NEESA-approved and EPA CLP laboratory, will also designate a QC Coordinator who will function as part of the project QC team. The duties of the laboratory QC Coordinator or designee will include, at a minimum, the following:

- Direct preparation of sample containers;
- Direct preparation and inclusion of blind QC samples in sample load in a fashion unrecognizable to analysts;
- Monitor use of known QC samples, blanks and duplicates, as required by specific projects;
- Maintain records of performance on known and blind QC samples as a measure of analytical precision and accuracy (control charts, etc.); and
- Direct and monitor record keeping and sample tracking activities.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

3.1 Introduction

The overall quality assurance objective for laboratory analysis of environmental samples is to provide a laboratory QA/QC program that is, at a minimum, equal to the U.S. EPA Contract Laboratory Program (CLP). The quality control limits of accuracy and precision for laboratory analyses are governed by the methods and equipment used. Laboratory QA/QC requirements defined in CLP protocol are designed to ensure that acceptable levels of data accuracy and precision are maintained throughout the analytical program. These requirements are detailed in the U.S. EPA CLP Statement of Work (SOW) for Organic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; revised August 1991 and in the U.S. EPA CLP SOW for Inorganic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; March 1990. These requirements will be followed during this study. In addition, Navy NEESA Level D analysis requirements will be followed when more stringent.

It must be recognized that QA objectives may be attainable only for samples that are homogeneous and do not have inherent matrix-related problems. In the event that QA objectives cannot be met on specific samples, groups of samples or sample types, the analytical laboratory will make every reasonable effort to determine the cause of non-attainment and, if such is due to instrument malfunction, operator error, or other identifiable cause within the control of the laboratory, the samples affected will be reanalyzed, if possible. Should non-attainment of QA objectives be due to sample inhomogeneity, sample matrix interference, or other sample-related causes, reanalyses will be treated as additional analyses.

For many EPA-approved methods, interlaboratory method verification studies have been used to establish QC criteria which may be regarded as an inherent part of the method. In those cases, such criteria will take precedence except for deviations from such criteria that can be reasonably attributed to sample-related cases.

The quality assurance objectives for all measurement data include considerations of precision, accuracy, completeness, representativeness, and comparability as described below.

3.2 Precision and Accuracy

The precision of a measurement is an expression of mutual agreement of multiple measurement values of the same property conducted under prescribed similar conditions. Precision reflects the repeatability of the measurement. Precision is evaluated most directly by recording and comparing multiple measurements of the same parameter on the same sample under the same conditions. Precision is usually expressed in terms of the standard deviation. The precision objectives for analytical parameters are specified in the CLP protocols. Except as otherwise specified by the method, the QC objective for precision under this project will be $\pm$20 percent (relative percent difference) as determined by duplicate analyses. It must be recognized that for analytes at concentrations of less than five times the method detection limit (MDL), this objective is unlikely to be met.

The degree of accuracy of a measurement is based on a comparison of the measured value with an accepted reference or true value, or is a measure of system bias. Accuracy of an analytical procedure is best determined based on analysis of a known or "spiked" sample quantity. The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined. The concentration of the analyte relative to the detection limit is also a major factor in determining the accuracy of the measurement. Except as otherwise specified by a method, the QC objective for accuracy under this project will be 75 to 125 percent (percent recovery), as determined by sample spike recoveries. Alternately, accuracy may be assessed through the analyses of appropriate standard reference materials, certified standards, or samples, as available.

3.3 Completeness

Completeness is a measure of the amount of valid data obtained from the measurement system relative to the amount anticipated under ideal conditions. This project's QC objective for completeness, as determined by the percentage of valid data generated, will be $\geq$90 percent.

3.4 Representativeness

Samples taken must be representative of the media. Where appropriate, the media will be statistically characterized to express: 1) the degree to which the data accurately and precisely represent a characteristic of a media, 2) parameter variations at a sampling point, and 3) a process, or an environmental condition. Sample selection and handling procedures will be conducted to obtain the most representative sample possible. Sampling devices will be decontaminated between sampling points to ensure that cross-contamination does not occur between samples.

Representativeness will also be monitored by collection and analysis of the following QC field samples:

- Trip blanks;
- Field blanks;
- Source water blanks; and
- Duplicate samples.

QC samples will be collected in accordance with Section 4.4.

Representative samples will be collected through the following actions:

- Collect samples from locations fully representing the site conditions;
- Use appropriate sampling procedures and equipment;
- Use appropriate analytical methodologies; and
- Analyze for appropriate parameters using appropriate detection limits.

Field duplicate and field blank samples will be shipped as blind samples to the laboratory. These samples will be numbered similarly to other samples except fictitious sample identifiers will be assigned. Trip blanks will be labelled as such and shipped with samples being analyzed for volatile organics. Samples for matrix spike and matrix spike duplicates will be designated on the chain-of-custody forms and sample labels. Water samples for matrix spike and matrix spike duplicate analyses for organic parameters will be collected in triplicate; samples for matrix spike analyses for inorganic parameters will be collected in duplicate.

The laboratory will make appropriate efforts to assure that the samples are adequately homogenized prior to taking aliquots for analysis, so reported results represent samples received. Some techniques of homogenization (e.g., compositing) expose the sample to significant risk of contamination or loss through volatilization, and will be avoided.

3.5 Comparability

Consistency in sample acquisition, handling, analysis and level of QA/QC is necessary so that the analytical results may be compared. Where appropriate, the results of the analyses will be compared with the results obtained in previous studies. The laboratory will also use EPA-approved methods and reporting units, in order to assure that the data will be comparable to other similarly generated data sets.

4.0 SAMPLING PROCEDURES

4.1 Introduction

The following matrices will be sampled during the SASE field investigation study at NETC/NUWC - Newport: soil, sediment, surface water, biota, and ground water. Sample collection and monitoring methodology are presented in Appendix B of this Work Plan. These procedures will be implemented in order to collect representative data for remedial planning guidance. All sample media collected will be handled in accordance with this Quality Assurance Project Plan and the Field Sampling Plan. All analytical methods and estimated detection limits are subsequently described in Section 7.0 of this document, including analysis for the Target Compound List (TCL) and Target Analyte List (TAL), as well as all other parameters for this project.

4.2 Selection of Sampling Locations

The locations of samples for each of the sites at NETC/NUWC Newport appear in the site specific SASE Plans provided as Volumes I through III of this Work Plan.

4.3 Sample Collection, Handling, and Shipping

It is important to use appropriate sample containers so that no chemical alteration occurs between the collection of samples in the field, and the receipt of samples at the laboratory. The sample bottles will be prepared and shipped to the field by the laboratory, under the direction of the laboratory QC coordinator. The sample bottles will be transported to the site within a sealed shipping cooler.

Sample containers will be selected to ensure compatibility with the potential contaminants and to minimize breakage during transportation. Aqueous phase samples for organic analyses will be contained in glass vials with teflon-lined, screw-type caps. Sample bottles, analytical methods and preservation required are listed in Table 1 for soil and sediment samples and in Table 2 for aqueous samples. Holding times are further defined in Table 3, for the analytical methods listed in Tables 1 and 2.

Sample labels will be filled out at the time of sampling and will be affixed to each container to identify the sample number, collector's name, date and time of collection, location of the sampling point, preservatives added, and analyses requested for the sample.

Ground water samples collected from all wells will be analyzed for total metals and consequently, filtering will not be conducted in the field prior to the addition of preservatives. Water samples to be analyzed for cyanide will be checked in the field for the presence of chlorine using potassium iodide (KI) starch paper. If chlorine is present, ascorbic acid will be added until the KI paper indicates that no chlorine is present.

After the bottles for a given sample site have been filled, they will be placed in a shipping cooler. Field personnel will add bags of crushed ice or ice packs to the shipping coolers as the samples are collected. Each sample container will be cushioned with packing materials and sealed in a refrigerated cooler container for shipment to the laboratory by overnight delivery. Daily sample collection activities will be scheduled in order to assure overnight delivery of samples.

A chain-of-custody record will be prepared and will accompany all samples to provide documentation of all samples collected and to trace sample possession. Chain-of-custody procedures are discussed in detail in Section 5 of this document.

4.4 Field Quality Control (QC) Samples

Table 4 lists the percentage of field QC samples per sample matrix for the Level C analyses, based on current Navy (NEESA) guidance. A sampling event is defined as the time from which the sampling personnel arrive at the site until these personnel complete the sampling task. An example of two events would occur if sampling personnel went to a site for 3 weeks, drilled borings, and installed ground water monitoring wells. During this task, soil and water samples were collected for laboratory analysis. The sampling crew subsequently left the site for two months, thus concluding the first sampling event. The crew later returned to collect another set of ground water samples over a 3-day period. The second visit would constitute the second sampling event.

Trip blanks, field blanks, and duplicate samples will be collected as part of each sampling event, in order to ascertain a measure of quality control during each sampling round. The following sections describe the purpose and usage of each of these types of samples.

4.4.1 Trip Blanks

Trip blanks are defined as samples which originate as analyte-free water which is placed in volatile organic vials and preserved with Hcl in the laboratory and shipped to the site in the sample cooler with sample containers. These vials are subsequently returned to the laboratory with samples for volatile organics analysis (VOA). One trip blank will accompany each cooler containing samples to be analyzed for VOAs, and will be stored at the laboratory with the samples. Trip blanks will be analyzed in order to evaluate the effect of ambient site conditions and sample shipment on sample integrity, and to ensure proper sample container preparation and handling techniques. All trip blanks will be labeled according to the proper chain-of-custody procedures and will be analyzed for volatile organic compounds.

4.4.2 Field Blanks

Field blanks will be collected to assess the effectiveness of the decontamination of sample collection equipment. The field blank will be collected by pouring laboratory-supplied, analyte-free deionized water for inorganic fraction analyses and HPLC-grade water for organic fraction analyses over the decontaminated sample collection equipment (i.e., bailer, stainless steel spoon, etc.) and into the appropriate sample containers. Field blanks will be collected for each matrix sampled. All field blanks will be analyzed for the same analytical parameters as the sample matrix. A minimum of one field blank will be collected for every 20 samples or per day per matrix, whichever is greater. All field blanks will be preserved in accordance with the methods specified in Table 2, labeled according to the proper chain-of-custody procedures, and stored and shipped according to the procedures discussed previously.

4.4.3 Source Water Blanks

Source water blanks consist of the source water (obtained from NETC-Newport water supply) used for decontamination (e.g., steam cleaning). At a minimum, one source blank from each source of water will be collected and analyzed for the same parameters as the related samples. In addition, samples of the distilled water used in sampling equipment decontamination will also be analyzed for the full TCL/TAL.

4.4.4 Field Duplicates

Duplicate samples will be collected, homogenized, and split. The procedure for collecting duplicate samples consists of alternating the collection of the sample between the sample collection bottle and the duplicate collection bottle. Samples for volatile organic compound analyses will not be mixed, but equal portions of the sample will be collected simultaneously and placed in 40-ml glass vials. Field duplicates will be collected at a frequency of 10 percent per sample matrix (NEESA - Level D). All duplicate samples will be sent as "blind" (unknown duplicate samples) to the primary laboratory responsible for the sample analysis.

4.4.5. Regulatory Splits

If regulatory agencies (state or federal) wish to obtain samples for independent analysis which are duplicates of those collected by TRC-EC, these regulatory split samples will be collected in the same manner as field duplicates. However, these splits will be sent by the regulatory agency to a separate, independent laboratory for analysis.

4.5 Field Decontamination Procedures

Drill rigs, backhoes, and drilling equipment will be decontaminated prior to moving to a site. Drilling equipment used for multiple boreholes will be decontaminated prior to each use. All decontamination of drill rigs and drilling equipment (e.g., augers, rods) will be conducted at designated decontamination areas with a steam cleaner. Decontamination of sampling equipment will be performed at designated decontamination areas. Sampling equipment such as split-spoons, stainless steel spoons or spatulas, and stainless steel mixing bowls will be decontaminated using the following procedures:

Wash and scrub with low phosphate detergent in tap water;
Rinse with tap water;

- Rinse with 10% nitric acid (1% nitric acid on carbon steel split-spoons);
- Rinse with tap water;
- Rinse with hexane and methanol - pesticide grade solvents or better;
- Rinse with distilled water (demonstrated to be analyte-free);
- Air dry - on clean polyethylene sheeting; and
- Wrap in aluminum foil, shiny side out for transport (if not being used immediately).

NOTE: Clean equipment may rest on -- but never be wrapped in clean polyethylene sheeting.

An attempt will be made to coordinate a drilling sequence hierarchy from less likely to more likely contaminated boring locations to reduce the potential for cross-contamination between locations. All sampling equipment will be decontaminated prior to use at each sampling location.

All decontamination rinsates will be collected and contained in drums for subsequent determination of proper handling and/or disposal.

5.0 SAMPLE CUSTODY

5.1 Introduction

Sample custody procedures will be observed to ensure the validity of the data generated during this program. Sample chain-of-custody will be initiated with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling samples will be restricted, and one person will be assigned the responsibility of field sample custodian.

On-site monitoring data will be controlled and entered daily in permanent log books, as appropriate. Personnel involved with the sample chain-of-custody process will be trained in sample collection and handling procedures prior to project initiation.

5.2 Field Sample Custody

Sample custody and documentation procedures described in this section will be followed throughout sample collection activities. Components of sample custody procedures include the use of field notebooks, sample labels, and chain-of-custody forms.

5.2.1 Field Notebooks

The TRC-EC project manager will oversee the maintenance of all field notebooks. Field notebooks will be bound books, preferably with consecutively numbered pages, that are at least 4 inches x 7 inches in size. Field notebooks will be maintained by the TRC-EC field team leader and other team members to provide a daily record of significant events, observations, and measurements during the field investigation activities. All notebook entries will be signed and dated.

All information pertinent to the field survey and/or sampling will be recorded in the notebooks. Field notebook entries will include the following information (at a minimum):

- Name and address of field contact;
- Name and title of author, date and time of entry, and physical/ environmental conditions during field activity;
- Names of field crew;
- Names and titles of any site visitors;
- Type of sampling activity;

- Location of sampling activity;
- Description of sampling point(s);
- Date and time of sample collection;
- Sample media (e.g., soil, sediment, ground water, etc.);
- Sample collection method;
- Number and volume of sample(s) taken;
- Analyses to be performed;
- Sample preservatives;
- Sample identification number(s);
- Field observations;
- Any field measurements made such as Ph, temperature, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s); and

All original data recorded in either the field notebooks, on sample labels, or in the chain-of-custody records will be written with waterproof ink. None of these accountable, serialized documents will be destroyed or discarded, even if they are illegible or contain inaccuracies.

If an error is made on an accountable document assigned to an individual, that individual will make all corrections by crossing a line through the error and entering the correct information and initialing the cross-out. The erroneous information will not be obliterated. Any subsequent error discovered on an accountable document will be corrected by the person who made the entry, and will be initialed and dated, as appropriate.

5.2.2 Sample Labels

All samples obtained at the site will be placed in an appropriate sample container for preservation prior to shipment to the laboratory. Each sample will be individually identified with a separate identification label recorded with a unique sample identifier. The information recorded on the label will include:

- Project name/project number/location;
- Sample identifier/number;
- Analysis to be performed;
- Preservatives used, especially any non-standard types, and any other field preparation of the sample;
- Date of collection;
- Time of collection (a four-digit number indicating the 24-hour (military) clock time of collection; e.g., 1430 for 2:30 p.m.);
- Number of containers per analyte (i.e., 1 of 2, etc.); and
- Sampler's initials.

Examples of TRC-EC's proposed sample identification labeling format for each sample type are presented in Appendix B of this Work Plan.

5.2.3 Custody Seals

Samples will be placed in sample coolers and the coolers will be sealed with custody seals prior to shipment to the laboratory. Clear adhesive tape will be placed over the seals to ensure that seals are not accidentally broken during shipment.

5.2.4 Chain-of-Custody Records

All samples will be accompanied by a chain-of-custody record, an example of which is shown on Figure 4. A chain-of-custody record will accompany the sample from initial sample container selection and preparation commencing at the laboratory, to the field for sample containment and preservation, and through its return to the laboratory. If samples are split and sent to different laboratories, a copy of the chain-of-custody record will be sent with each sample.

The "Remarks" column in the chain-of-custody record will be used to record specific considerations associated with sample acquisition such as: sample type, container type, and sample preservation methods. When transferring samples, the individuals relinquishing and assuming sample custody will sign, date, and note the transfer time on the record.

A minimum of two copies of the chain-of-custody record will follow each sample to the laboratory. The laboratory will maintain one file copy, and the completed original will be returned to the TRC-EC Project Manager. A copy of the completed original will be returned as a part of the final analytical report. This record will be used to document sample custody transfer from the sampler, to another TRC-EC team member, to a shipper, or to the laboratory, and also to verify the date of sample receipt in the laboratory.

Shipments will be sent by overnight carrier with appropriate bill of lading documentation. Bills of lading will be retained as part of the permanent program documentation.

5.2.5 Sample Shipment

Samples will be delivered to the laboratory for analysis as soon as practical after the number of samples and sample containers is sufficient to comprise a shipment, preferably the same day the samples are collected. Sample shipment will occur at a minimum frequency of every other day. All samples will be stored in coolers at a temperature of 4°C. The samples will be accompanied by the chain-of-custody record. During sampling and sample shipment activities, the TRC-EC field team leader (or his designee) will contact the laboratory daily to provide information about impending shipments.

5.2.6 Sample Master Log Notebook

In addition to the field notebook documentation, all samples will be documented in a master sample log notebook for future reference. This master sample log will include the following information: sample identifier, sampling date and time (military), sampling personnel, matrix type (i.e., soil), containers/parameters for analysis, date and method of shipment, any sample preservation, and any other pertinent information relating to the sample(s). The master sample log will be consistently updated during sampling activities in the field for review during field audits. Upon completion of sampling activities, the master sample log notebook will be delivered to the TRC-EC Project Manager.

5.3 Laboratory Sample Custody

The TRC-EC Field QC Coordinator will notify the laboratory of upcoming field sampling activities and subsequent sample transfer to the laboratory. This notification will include information concerning the number and type of samples to be shipped, as well as the anticipated sample arrival date.

The laboratory will designate a sample custodian who will be responsible for maintaining sample custody and for maintaining all associated custodial documentation records. After receiving the samples, the sample custodian will check the original chain-of-custody record and request for analysis documents against the labeled contents of each sample container for correctness and traceability. The sample custodian will then sign the chain-of-custody record and record the date and time that the sample shipment was received at the laboratory. The samples will then be logged into the laboratory system.

Care will be exercised in the laboratory to annotate any labeling or descriptive errors associated with the sample containers. In the event of discrepant documentation, the laboratory will immediately contact the TRC-EC Field QC Coordinator as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.

Samples will be stored in a secured dark area and at a temperature of approximately 4°C, if necessary, until analyses are performed. A laboratory chain-of-custody record will accompany the sample or sample fraction through final analysis for sample control. A copy of the chain-of-custody record will accompany the laboratory's analytical report and will become a permanent part of the project's records. The pH of incoming water samples will be checked by the laboratory when preservatives have been added to the sample. Details of the chain-of-custody for laboratory activities will be provided in the laboratory's QA manual.

5.4 Evidence File

The TRC-EC Project Manager will serve as file custodian. At the project's completion, the files will be returned to the Navy's Northern Division Office where they will be permanently archived.

The evidence file will contain all incoming materials related to the project such as: sketches, correspondence, authorizations, and logs. These documents will be placed in the project file as soon as possible. If correspondence is needed for reference by project personnel, a copy will be made rather than manipulating the original. All records shall be legible and easily identifiable.

Examples of the types of records that will be maintained in the project file are:

- Field documents;
- Correspondence;
- Photographs;
- Laboratory data;
- Reports; and
- Subcontract agreements.

Out-going project correspondence and reports will be reviewed by the Project Manager or designee prior to mailing.

To prevent the inadvertent use of obsolete or superseded project-related procedures, all personnel of the laboratory and project staffs will be responsible for reporting changes in protocol to the Laboratory Project Manager and the Laboratory Director. The Laboratory Project Manager and Laboratory Director will then inform the project and laboratory staffs and the Quality Assurance Officer of these changes, as appropriate.

Revisions to procedures shall be subject to the same level of review and approval as the original document. Outdated procedures shall be marked "void". The voided document may be destroyed at the request of the Laboratory Project Manager; however, it is recommended that one copy of the voided document be maintained in the project file. The date and reason why the document was voided will be recorded.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the instrument manufacturer's specifications.

Laboratory instrumentation calibration procedures and frequencies are specified in the Contract Laboratory Program (CLP) Statement of Work (SOW), for Organic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; revised July 1991 and in the CLP SOW for Inorganic Analysis; Multi-Media, Multi-Concentration; SOW No. 3/90; September 1991, and will be strictly followed for those analytes analyzed by CLP protocols. For all other analyses for which EPA-approved methods exist, the laboratory will employ such methods and follow the specified calibration procedures and frequencies. The laboratory quality control program includes strict adherence to routine calibration procedures. A description of calibration procedures and frequencies for non-CLP methods will be provided by the laboratory selected for this program.

Analysis of blank samples, duplicate samples, spiked blanks, and matrix blanks will be performed where possible to document the effectiveness of calibration procedures. Method blanks contain all the reagents used in the preparation and analysis of the samples and are processed through the entire analytical scheme to assess spurious contamination from reagents, glassware and other materials used during analysis. The terms method blank and laboratory blank are interchangeable. A matrix blank denotes a blank of a similar matrix (e.g., for liquids a blank of distilled-deionized reagent grade high purity water may be used; for soils/sediments high purity sand may be used). A spike blank is a method blank which has had a known concentration of a particular compound or analyte added to it to assure adequate percent recovery of the compound/analyte.

Records of calibration, repair, or replacement will be maintained by the designated laboratory personnel performing quality control activities. Calibration records of assigned laboratories will be filed and maintained at the laboratory location where the work is performed and subject to QA audit.

Calibration of field instruments will be performed at approved intervals as specified by the manufacturer or more frequently, as conditions dictate. At a minimum all field instruments will be calibrated at the beginning and end of each day. Calibrations may also be performed at the start and completion of each test run; however, such calibrations will be re-initiated as a result of delay due to meals, work shift change, or instrument damage. Calibration standards used as reference standards will be traceable to the National Bureau of Standards (NBS), when possible. Calibration procedures for field instruments will be as specified by the instrument manufacturer. Equipment manuals describing calibration procedures will be maintained in the field office during site investigations.

samples or every two hours of continuous instrument operation. The value of the continuing calibration standard concentration must agree with requirements of the CLP SOW.

Consistent with EPA protocol, unfiltered ground water samples will be analyzed for TAL metals.

7.4 <u>Toxicity Characteristic Leaching Procedure (TCLP) Analysis</u>

TCLP extraction and analysis will be conducted using methods outlined in U.S. EPA TCLP Method 1311, as presented in 40 CFR Part 261.24, Appendix II.

7.5 <u>Total Organic Carbon</u>

Total Organic Carbon (TOC) will be measured in the laboratory using EPA method 415.

7.6 <u>Water Quality Parameters</u>

Several water quality parameters will be measured in the field following sample collection, and/or during development procedures. Temperature, pH, specific conductivity, dissolved oxygen, and salinity will be measured with field instrumentation. In general methods used to collect these measurements will follow approved EPA (SW-846, Third Edition) or Standard Methods procedures. Total chloride will be measured in the laboratory using EPA Method 325. Alkalinity would be measured using EPA Method 310. Specific parameters which will be measured during well development procedures or prior to collection of water samples are provided in the Study Area specific Work Plans.

is not achievable for a particular sample, an explanation of the problem and supporting evidence will be provided by the laboratory in the case narrative summary submitted with the deliverables.

Each set of samples will be analyzed in conjunction with the analysis of QC samples, including field duplicates, blanks, matrix spikes and matrix spike duplicate (MS/MSD) samples for quality control determinations. The frequency of analysis of the QC samples, as previously presented in Section 4.4, will not be less than one per 20 samples and at least one per sampling day for field blanks, not less than one per 10 samples for field duplicates, and not less than one per 20 samples for MS/MSD samples (see Table 2). All samples, field duplicates, blanks, matrix spike and matrix spike duplicates will be fortified with surrogate spiking compounds as shown in Table 8. The CLP recommended guidelines for percentage recovery of the surrogate compounds are provided in Table 9. The percentage recovery of the matrix spiking compounds and relative percentage difference of duplicate analyses will be calculated to obtain measurements of the analyses accuracy and precision.

7.3 Target Analyte List - Metals

All water and soil samples will be prepared for analyses as described by procedures for each respective matrix and analysis method described in the U.S. EPA CLP, Statement of Work for Inorganic Analyses (SOW 3/90). Each set of samples, or 20 samples, whichever is more frequent, will be analyzed with a preparation blank, duplicate sample, and matrix spiked sample. Each group of 20 samples will be analyzed with a laboratory control sample of similar matrix. The Target Analyte List (TAL) for metals and inorganics and associated detection limits are listed in Table 10.

The atomic absorption (AA) instrument will be calibrated through the use of a minimum of three calibration standards prepared by dilution of certified stock solutions. Calibration standards will contain acid(s) at the same concentration as the digestates. An analysis blank will then be prepared, and one calibration standard will be at the EPA-CLP required detection limit for the metal being evaluated. The other standard concentrations will bracket the concentration range of the samples. A continuing calibration standard, prepared from a different stock solution than that used for the calibration standards, will be prepared and analyzed after every ten samples or every two hours of continuous instrument operation. The value of the continuing calibration standard concentration must agree with requirements of the CLP SOW.

Consistent with EPA protocol, unfiltered ground water samples will be analyzed for TAL metals.

7.4 Toxicity Characteristic Leaching Procedure (TCLP) Analysis

TCLP extraction and analysis will be conducted using methods outlined in U.S. EPA TCLP Method 1311, as presented in 40 CFR Part 261.24, Appendix II.

7.5 Water Quality Parameters

Several water quality parameters will be measured in the field following sample collection, and/or during development procedures. Temperature, pH, specific conductivity, dissolved oxygen, and salinity will be measured with field instrumentation. In general methods used to collect these measurements will follow approved EPA (SW-846, Third Edition) or Standard Methods procedures. Total chloride will be measured in the laboratory using EPA Method 325. Alkalinity would be measured using EPA Method 310. Specific parameters which will be measured during well development procedures or prior to collection of water samples are provided in the Study Area specific Work Plans.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 Introduction

The procedures used for calculations and data reduction are specified in each analytical method referenced in Section 7.0 of this document. Raw data will be entered in bound laboratory notebooks. A separate book will be maintained for each analytical procedure. The data will be entered such that sufficient space remains to enter all subsequent calculations required to arrive at the final (reported) value for each sample. Calculations include factors such as sample dilution ratios, corrections for titrant normality, and conversion to dry-weight basis for solid samples. Instrument chart recordings and calculator printouts will be labeled and attached to their respective pages, except for voluminous gas chromatograms which will be cross-referenced and stored separately.

Calculations will be checked from the raw data to final value stages prior to reporting the results for a group of samples. Results obtained from extreme ends of standard curves generated by linear regression calculator programs will be checked against graphically-produced standard curves if the correlation coefficient of a program curve is less than 0.995.

Data will generally be reported as micrograms of analyte per liter for aqueous samples or micrograms per kilogram (dry weight) for solid or non-aqueous liquid samples. Concentration units will always be listed on reports and any special conditions, such as dry weight conversions, will be noted. The data reporting form will also include the unique sample number assigned to each sample, details of sample collection including the client's identification number, and the dates of sample receipt and report preparation.

8.2 Data Reduction

8.2.1 Target Compound List Compounds

Instrument performance test data will accompany the raw data during data reduction. The following criteria must be attained to make a qualitative identification of an organic pollutant using Gas Chromatograph/Mass Spectrometer (GC/MS) techniques:

Characteristic ions for each compound of interest must maximize in the same or within one scan of each other.

- Retention time must occur within ± 1 percent of the retention time of the authentic compound.

- Relative peak heights of the three characteristic ions in the Extracted Ion Current Profile (EICP) must fall within $\pm$ 20 percent of the relative intensities of these ions in a reference mass spectrum. The reference mass spectrum can be obtained by a standard analyzed in the GC/MS system or from a reference library.

The entire mass spectrum of the compound of interest is compared to the reference compound.

Structural isomers having similar mass spectra can be explicitly identified only if the resolution between authentic isomers in a standard mix is acceptable. Acceptable resolution is achieved if the baseline-to-valley height between the isomers is less than 25 percent of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

When a compound has been identified, the quantitation of that compound is based on the integrated abundance from the EICP of the primary characteristic ion. The base peak ion of internal and surrogate standards is used in the quantitation. If the sample produces an interference for the first listed ion, a secondary ion is used to quantitate. Quantification is performed using internal standard techniques.

To ensure that reported data are accurate, all resultant data are verified. Retention items and area counts are checked carefully for correct identification and accurate quantification.

8.2.2 Metals and Cyanide

The concentrations of metals determined by Atomic Absorption Spectroscopy (AAS) measurements are obtained by comparison of absorbance values with those obtained from the analyses of known standards. A linear regression plot of absorbance versus concentration will be used to determine a concentration factor for linearity of response.

In the event of low (<85%) or high (>115%) post-digestion spike recovery, the analysis will be repeated using the method of known additions to determine potential matrix interferences. CLP criteria will be maintained for analyses of samples of similar matrix. The mean percentage recovery and standard deviation will be calculated from a minimum of 20 analyses. A warning limit of ± 2 standard deviations from the mean and a control limit of ± 3 standard deviations will be used to establish that the test is providing accurate data.

8.3 Data Validation

Data validation is the process of reviewing data and associated quality control criteria and accepting, qualifying, or rejecting it on the basis of sound criteria. Project supervisory and QC personnel will use validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data will be maintained, even that judged to be an "outlying" or anomalous value. The QA/QC Manager validating the data will have sufficient knowledge of the technical work to identify questionable values.

8.3.1 Field Data Validation

Field sampling data will be validated by the TRC-EC Field QC Coordinator or QA/QC Manager, based on their judgment of the representativeness of the sample, maintenance and cleanliness of sampling equipment, and adherence to the approved, written sample collection procedure.

The following criteria will be used to evaluate the field sampling data:

- Use of approved sampling procedures;
- Use of reagents/standards that conform to QC-specified criteria; and
- Proper chain-of-custody maintained and documented.

8.3.2 Analytical Data Validation

Analytical data validation will include validation procedures within the laboratory and independent of the laboratory.

Data from laboratory analyses will be validated by the Laboratory QC Coordinator using criteria outlined below. Results from field and laboratory method blanks, replicate samples, equipment rinsates and internal QC samples will be used to validate analytical results.

The criteria listed below will be used to evaluate the analytical data:

- Use of approved analytical procedures;
- Use of properly operating and calibrated instrumentation;
- Acceptable results from analyses of laboratory control samples (i.e., the reported values should fall within the 95 percent confidence interval for these samples); and
- Precision and accuracy for this project should be comparable to that achieved in previous analytical programs and consistent with objectives stated in Section 7.

Independent of the analytical laboratory, analytical data validation will be conducted which will follow the most stringent of the requirements and protocols specified in the following documents:

U.S. EPA, "Region I Laboratory Data Validation: Functional Guidelines for Evaluating Organic Analyses", February 1988; modified November 1988;

U.S. EPA, "Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", June 1988, modified February 1989;

U.S. EPA, Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, 3/90, revised August 1991;

U.S. EPA, Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, 3/90, revised September 1991; and

U.S. Navy/NEESA, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program (NEESA 20.2-047B), June 1988.

The ground water and surface water SASE data will be 100% EPA Level IV validated in accordance with these requirements. Soil/sediment SASE data will be 50% EPA Level IV validated. The soil/sediment sample data which would be validated would include all of the surface soil, sediment samples, and one of the subsurface soil samples from each boring location. Validation of additional soil/sediment data would be conducted as necessary. Unvalidated data will be reviewed by TRC-EC for adherence to general QC guidelines (e.g., holding times, blank results).

The data validation activities focus on areas of the analytical process which are under the laboratory's control when analyzing samples. The data qualifiers which result from validation represent the QC areas under the laboratory's control which could have been improved. Qualifiers attached to the data during validation supersede the qualifiers assigned by the laboratory.

Areas reviewed in the validation of organic data include the following: sample holding times, gas chromatography/mass spectroscopy (GC/MS) tuning, instrument calibration, blank analysis, surrogate recovery, matrix spike/matrix spike duplicates, internal standards (IS) performance, Target Compound List (TCL) compound identification, compound quantitation and reported detection limits, tentatively identified compounds, system performance, and overall assessment of the data for usability.

The areas reviewed in the validation of inorganic data include the following: sample holding times, instrument calibration and initial calibration verification, continuing calibration verification, Contract Required Detection Limit (CRDL) standards for Atomic Absorption (AA) and Inductively Coupled Plasma (ICP) spectrometers, initial and continuing calibration blank analysis, ICP interference check sample analysis, spiked sample analysis, post digested spike sample recovery analysis, duplicate sample analysis, laboratory control sample analysis, ICP serial dilution analysis, graphite furnace AA QC analysis, quarterly verification of instrument parameter report, and sample result verification.

8.4 Identification and Treatment of Outliers

Any data point which deviates markedly from others in its set of measurements will be investigated; however, the suspected outlier will be recorded and retained in the data set. The following tests will be used to identify outliers.

Dixon's test for extreme observations is an easily computed procedure for determining whether a single very large or very small value is consistent with the remaining data. The one-tailed t-test for difference may also be used in this case. It should be noted that these tests are designed for testing a single value. If more than one outlier is suspected in the same data set, other statistical methods, such as analysis of variance, tolerance intervals, or control charts, will be considered and the most appropriate method will be used and documented.

Since an outlier may result from unique circumstances at the time of sample analysis or data collection, those persons involved in the analysis and data reduction will be consulted. This may provide information on an experimental reason for the outlier. Further statistical analysis will be performed with and without the outlier to determine its effect on the conclusions. In many cases, two data sets will be reported, one including and one excluding the outlier.

In summary, every effort will be made to include the outlying values in the reported data. If the value is rejected, it will be identified as an outlier, reported with its data set and its omission noted.

8.5 Analytical Deliverables

Analytical deliverables will meet the requirements of the USEPA CLP SOW for Organic Analysis; Multi-Media, Multi-Concentration, 3/90, revised July 1991, and the USEPA CLP SOW for Inorganic Analysis, Multi-Media, Multi-Concentration, 3/90, revised September 1991.

9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

9.1 Introduction

Quality control checks will be performed to ensure the collection of representative samples and the generation of valid analytical results on these samples. These checks will be performed by project participants through the program under the guidance of the TRC-EC QA Officer.

9.2 Data Collection and Sampling QC Procedures

The TRC-EC internal QC checks for the sampling aspects of this program will include, but not be limited to, the following:

- Use of field notebooks to ensure completeness, traceability, and comparability of the samples collected.
- Field checking of field notebooks and sample labels by a second person to ensure accuracy and completeness.
- Strict adherence to the sample chain-of-custody procedures outlined in Section 5 of this document.
- Collection and analysis of trip blanks, source blanks, field blanks, and field duplicates.
- Calibration of the field monitoring equipment (e.g., HNU, OVA), as described in Section 6 of this document.

9.3 Analytical QC Procedures

9.3.1 Trip Blank Analysis

Volatile organic samples are susceptible to contamination by diffusion of organic contaminants through the Teflon-faced silicone rubber septum of the sample vial. Therefore, trip blanks will be analyzed to monitor for possible sample contamination during shipment. Trip blanks will be prepared by filling two volatile vials with laboratory-supplied, organic-free water which then will be shipped with the field sampling kit. Trip blanks will be preserved by the laboratory with hydrochloric acid. Trip blanks accompany the sample bottles through collection and shipment to the laboratory and are stored with the samples. Following the analyses, if the trip blanks indicate possible contamination of the samples, depending upon the nature and extent of the contamination, the sample results will be qualified with respect to the contamination detected in the trip blanks. Results of trip blank analyses will be maintained with the corresponding sample analyses data in the project file.

9.3.2 Reagent Blank Analysis

A reagent blank is a volume of deionized, distilled laboratory water carried through the entire analytical procedure. The volume of the blank must be approximately equal to the sample volume processed. A reagent blank should be performed with each group of samples. Analysis of the blank verifies that method interferences caused by contaminants in solvents, reagents, glassware, and other sample processing hardware are known and minimized. Optimally, a reagent blank should meet CLP criteria. Results of reagent blank analyses will be maintained with the corresponding analytical data in the project file.

9.3.3 Duplicate Sample Analysis

Duplicate analyses are performed to evaluate the precision of an analysis. Results of the duplicate analyses are used to determine the relative percent differences between duplicate samples. Field (blind) duplicate samples will be collected for each media sampled at a frequency of one per ten samples collected. Duplicate analysis results will be reported together in the final SASE report.

9.3.4 Verification/Reference Standard

On a quarterly basis, the laboratory Quality Control Coordinator introduces a group of prepared verification samples, or standard reference materials, into the analytical testing regime. The laboratory checks and approves the purity of standards and reagents prior to use. Results of the verification/reference standard data will be summarized, evaluated, and presented to laboratory management for review and corrective actions, if appropriate.

9.3.5 Other Laboratory Quality Control Checks

Quality control checks will be performed to ensure the collection of representative samples and the generation of valid analytical results on these samples. These checks are performed by project participants under the guidance of QC personnel.

The laboratory will make use of various types of QC samples to document the validity of the generated data. The following types of QC samples are routinely used:

> Calibration Check Samples--One of the working calibration standards which is periodically used to check that the original calibration is still valid.
>
> Spiked Samples--Replicate aliquots of project samples are spiked with components of interest and carried through the entire preparative and analytical scheme.
>
> Laboratory Control Samples (LCS)--These samples are prepared from EPA Environmental Monitoring Systems Laboratory (EMSL) concentrates or National Bureau of Standards (NBS) standard reference materials. The LCS are used to establish that an instrument or procedure is in control. An LCS is normally carried through the entire sample preparation and analysis procedure.
>
> Surrogate Spikes--Samples requiring analysis by GC/MS are routinely surrogate-spiked with a series of deuterated analogues of the components of interest. It is anticipated that these compounds would assess the behavior of actual components in individual program samples during the entire preparation and analysis scheme.
>
> Matrix Spikes/Matrix Spike Duplicates (MS/MSD)--One MS/MSD pair will be run per 20 samples for each different matrix analyzed. These pairs will be spiked with the target compounds of concern for that matrix.

All values which fall outside the QC limits described in the analytical method will be noted. The following analytical guidelines will be used to check recovery values which fall outside the QC limits:

1. All recovery data are evaluated to determine if the QC limits are appropriate and if a problem may exist even though the limits are being achieved (e.g., one compound that is consistently barely within the lower limit).

2. All recovery data which are outside the established limits are evaluated. This evaluation includes an independent check of the calculation.

3. Corrective action is performed if any of the following are observed:

   - All recovery values in any one analysis are outside the established limits.
   - Over 50 percent of the values for a given sample set are outside limits.
   - One compound is outside the limits in over 50 percent of the samples.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity. Each lot of acid or solvent used is checked for acceptability prior to laboratory use. All reagents are labeled with the date received and date opened. All glassware is precleaned according to specifications contained in the analytical method. Standard laboratory practices for laboratory cleanliness, personnel training, and other general procedures are used. A summary of all laboratory quality control analyses and the corresponding control determination is presented in Table 11.

9.3.6 Laboratory Control Charts

The control chart displays data in a format which graphically compares the variability of all test results with the average or expected variability of small groups of data. The variability may be due to random (indeterminate) or assignable (determinate) causes. The control chart distinguishes indeterminate from determinate variation in a process or method by its control limits. If a value falls outside the control limits, it is considered out-of-control, almost certainly due to a determinate cause which has been added to the indeterminate variations. The control chart signals the need to investigate, find the determinate cause, and correct it. Construction of a control chart requires a minimum of 14 to 20 duplicate sets of data points (which limits its use).

QC samples and instrument calibrations lend themselves most readily to the gathering of the data. Calculation of control limits and the values are usually plotted chronologically so that trends or cycles can be readily detected. If QC sample measurements show an out-of-control condition, it can be expected that subsequent sample analyses might yield invalid data. The control chart is an effective indicator of the need for corrective action.

For volatile and semi-volatile organics and pesticide analyses performed by GC/MS, surrogate recoveries from the method blank are the control sample. For other organics (e.g., PCBs, dioxins/furans), an LCS (spiked blank) is used to plot the control charts. An LCS is also used as the control point for inorganic analyses.

10.0 PREVENTIVE MAINTENANCE

10.1 Preventive Maintenance Procedures

Field equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators.

The laboratory will follow an orderly program of positive actions to prevent the failure of laboratory equipment or instruments during use. This preventive maintenance and careful calibration helps to assure accurate measurements from instrumentation. Routine maintenance procedures are followed for all instruments, glassware, reagents, analytical balances, and equipment used to produce deionized water. Specific procedures will be outlined in the laboratory Standard Operating Procedures (SOPs).

10.2 Schedules

Manufacturer's procedures identify the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to this maintenance schedule and to arrange any necessary and prompt service as required. Service to the equipment, instruments, tools, gauges, etc., shall be performed by qualified personnel.

In the absence of any manufacturer's recommended maintenance criteria, a maintenance procedure will be developed by the operator based upon experience and previous use of the equipment.

10.3 Records

Logs are maintained to record maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when and if equipment, instruments, tools and gauges are used at the sites. The project QA officer may audit these records to verify complete adherence to these procedures.

10.4 Spare Parts

Critical spare parts are maintained by TRC-EC and the laboratory for field and analytical equipment, respectively. These spare parts will be stored for availability and used in order to reduce equipment downtime.

11.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

11.1 Introduction

Procedures used to assess data precision and accuracy will be in accordance with 44 FR 69533 "Guidelines Establishing Test Procedures for the Analyses of Pollutants", Appendix III Example Quality Assurance and Quality Control Procedures for Organic Priority Pollutants", December 3, 1979. Completeness is recorded by comparing the number of parameters initially analyzed with the number of parameters successfully completed and validated. For this project, a target control limit of greater than 90 percent will be used.

11.2 Accuracy

The percent recovery is calculated as:

$$\% = \frac{S_o - S_s}{S} \times 100$$

where:

So = The background value, i.e., the value obtained by analyzing the sample.

S = Concentration of the spike added to the sample.

Ss = Value obtained by analyzing the sample with the spike added.

% = Percent recovery.

11.3 Precision

The relative percent difference is calculated as:

$$1/2 \times \frac{(V_1 - V_2)}{(V_1 + V_2)} \times 100 = \%\ \text{difference}$$

where:

V1,V2 = The two values obtained by analyzing the duplicate samples.

11.4 Completeness

Completeness will be reported as the percentage of all measurements made whose results are judged to be valid. The procedures to be used for validating data and determination of outliers are contained in Section 8.0. The following formula will be used to estimate completeness:

$$C = 100 \times \frac{V}{T}$$

where: C = Percent completeness.

V = Number of measurements judged valid.

T = Total number of measurements.

12.0 CORRECTIVE ACTION

12.1 Introduction

The acceptance limits for the sampling and analyses under this program will be those stated in the method or defined by other means in the QA/QC Plan. Corrective actions are often immediate in nature, implemented by the analyst or Project Manager. The corrective action usually involves recalculation, reanalysis, or repeating sample collection.

12.2 Immediate Corrective Action

If an immediate corrective action can be taken as part of normal operating procedures, the collection of poor quality data can be avoided. Instrument and equipment malfunctions are amenable to this type of action. QC procedures include troubleshooting guides and corrective action suggestions. The actions taken will be noted in field or laboratory notebooks, but no other formal documentation is required, unless further corrective action is necessary. These on-the-spot corrective actions are an everyday part of the QA/QC system.

Corrective action during the field sampling portion of a program is most often a result of equipment failure or an operator oversight and may require repeating a sampling run. Operator oversight is best avoided by having field crew members audit each others' work before and after a test. Every effort will be made by the field team leader to ensure that all QC procedures are followed. If potential problems are not solved as an immediate corrective action, TRC-EC will apply formalized long-term corrective action, if necessary.

Corrective action for analytical work will include recalibration of instruments, reanalysis of known QC samples and, if necessary, reanalysis of actual field samples. Specific QC procedures and checklists are used by the laboratory to help analysts detect the need for corrective action. Often the person's experience will be valuable in alerting the operator to suspicious data or malfunctioning equipment.

12.3 Long-Term Corrective Action

The need for long-term corrective action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem which cannot be solved by immediate corrective action falls into the long-term category. The TRC-EC QA system ensures that the quality problem is reported to a person responsible for correcting it, and who is part of a closed-loop action and follow-up plan.

The essential steps in the closed-loop corrective action system are listed below:

- Identify and define the problem;
- Assign responsibility for investigating the problem;
- Investigate and determine the cause of the problem;
- Determine a corrective action to eliminate the problem;
- Assign and accept responsibility for implementing the corrective action;
- Establish effectiveness of the corrective action and implement it; and
- Verify that the corrective action has eliminated the problem.

Documentation of the problem is important to the system. A Corrective Action Request Form (Figure 5) is filled out by the person finding the quality problem. This form identifies the problem, possible causes, and the person responsible for action on the problem. The responsible person may be an analyst, field team leader, QC coordinator, or the QA Officer. If no person is identified as responsible for action, the QA Officer investigates the situation and determines who is responsible in each case.

The Corrective Action Request Form includes a description of the corrective action planned and the date it was taken, and space for follow-up. The QA Officer checks to be sure that initial action has been taken and appears effective and, at an appropriate later date, checks again to see if the problem has been fully solved. The QA Officer receives a copy of all Corrective Action Forms and enters them in the Corrective Action Log. This permanent record aids the QA Officer in follow-up and makes any quality problems visible to management. The log may also prove valuable in listing a similar problem and its solution.

12.4 Out-of-Control Events and Corrective Action

Procedures are outlined as to what corrective action is taken if an out-of-control event occurs, and how it is documented and used to improve laboratory performance. Procedures for assuring that results for samples processed during out-of-control conditions are not reported are also outlined, as well as the conditions necessary to reestablish control and criteria for assuring the system is operating properly. The documentation is easily used by all personnel and is part of routine laboratory procedure.

It is recognized that several levels of out-of-control events may occur. Three examples are given below with corrective actions to be taken:

1. Observations Corrected by Analyst at the Bench--The calibration of an instrument is not linear. The analyst finds this and corrects it prior to continuing to analyze samples. The laboratory documents this event and notes that the corrective action was to recalibrate, and that no samples were affected as none were analyzed prior to calibration.

2. Corrective Actions Taken by Supervisor--A matrix spike recovery is out-of-control and the laboratory supervisor finds this after the samples for the day have been analyzed. The supervisor documents that the laboratory blank spiked with surrogates or standards was in control and that other sample spikes were in control, therefore, no re-analysis of the sample is required.

3. Corrective Actions at the Receiving Level--The sample container is broken. The analyst notes this and documents whether or not more sample is available. If no more sample is available, TRC-EC is notified and the decision documented.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

13.1 Internal TRC-EC Reports

The Project QC Coordinator will provide monthly reports of QC activities for the TRC-EC QA Officer and QA/QC Manager. These reports detail the results of quality control analysis, problems encountered, and any corrective action required.

All Corrective Action Forms will be submitted to the TRC-EC QA Officer for initial approval of the corrective action planned. A copy will be provided to the appropriate technical division manager. All system audit reports will be provided to the Program Manager and Project Manager.

13.2 Laboratory Reports

The laboratory QC Coordinator prepares written quarterly reports on QC activities for the laboratory Technical Director and QA Manager. These reports detail the results of QA procedures, problems encountered, and any corrective action which may have been required. All Corrective Action forms are submitted to the QA Manager for initial approval of the planned corrective action, and a copy is provided to the Technical Director. All system audit reports are provided to the Technical Director.

Each data transmittal contains a summary of QA/QC activities; this summary will include:

- Estimates of precision, accuracy and completeness of data;
- Reports of performance and system audits;
- Quality problems found; and
- Corrective actions taken.

The final data report submitted to TRC-EC by the laboratory will include a summary of QA/QC activities during the project. The QC Coordinator and QA Manager will participate in preparing this report. The summary of QA/QC results for the analytical work conducted for the NETC/NUWC SASE project will be included in the final SASE Report.

13.3 Reports to the U.S. Navy Northern Division

The status of on-going laboratory QA/QC activity will be presented in the project progress reports. Monthly progress reports will be sent from the laboratory to the Navy's Engineer-In-Charge and NEESA QA/QC contract representative, as required. The final SASE report for the project will include a section summarizing the significant findings of all QA/QC laboratory activity.

QUALITY ASSURANCE/QUALITY CONTROL PLAN
LIST OF TABLES

TABLE 1

CONTAINERS AND PRESERVATION METHODS FOR SOIL, SEDIMENT, AND/OR WASTE SAMPLES

Number Containers per Sample[a]	Sample Container	Preservation Methods[b]	Analytical Method	Compounds (2)
<u>Organics</u>				
2	125 ml, wide-mouth glass, Teflon -lined cap	Cool, 4°C	CLP SOW	TCL VOA
1	1-250 ml, wide-mouth amber glass, Teflon -lined cap	Cool, 4°C	CLP SOW	TCL-BNA, P/P Dioxins/Furans[c] Hydrocarbons
<u>Inorganics</u>				
1	250-ml, wide-mouth glass, Teflon -lined cap	Cool, 4°C	CLP SOW[d]	Metals and Cyanide
<u>TCLP</u>				
1	125-ml, wide-mouth glass, Teflon-lined cap	Cool, 4°C	SW-846	TCLP Volatiles, Semivolatiles, metals, pesticides, and herbicides

VOA = Volatile Organic Analyses.
TCL = Target Compound List.
BNA = Base Neutral and Acid Extractable Analyses.
P/P = Pesticide/PCB Analyses.
CLP SOW = Contract Laboratory Program - Statement of Work.
Organics - SOW 3/90, revised July 1991.
Inorganics - SOW 3/90, revised September 1991.

(a) One in 20 organic soil samples will be collected in triplicate for matrix spike and matrix spike duplicate analyses in accordance with CLP protocols and one in 20 inorganic soil samples will be collected in duplicate for matrix spike analyses.

(b) All samples will be stored in a refrigerated, dark area.

(c) Modified Method 8280. Archived samples may be analyzed for dioxins/furans

(d) Metals analyses, except mercury, will be performed by the furnace atomic absorption (As, Pb, Se, Tl) and inductively coupled plasma (ICP) atomic emission spectrometric methods. Mercury will be analyzed by the manual cold vapor atomic absorption method. Total cyanide will be analyzed by the manual spectrophotometric method.

TABLE 2

CONTAINERS AND PRESERVATION METHODS FOR AQUEOUS SAMPLES

Number Containers per Sample[a]	Sample Container	Preservation Methods[b]	Analytical Method	Compound(s)
Organics				
2	40 ml, glass, Teflon -lined cap	Cool, 4°C HCl to pH < 2	CLP SOW	TCL-VOA
1	1-gal, narrow-mouth amber glass, Teflon -lined cap	Cool, 4°C	CLP SOW	TCL-BNA, P/P
Inorganics				
1	500 ml, polyethylene	Cool, 4°C HNO_3 to pH <2	CLP SOW[c]	Metals
1	1 L, polyethylene	Cool, 4°C NaOH to pH >12[d]	CLP SOW[c]	Cyanide

TCL = Target Compound List.
VOA = Volatile Organic Analyses.
BNA = Base Neutral and Acid Extractable Compounds.
P/P = Pesticides/PCB Analyses.
CLP SOW = Contract Laboratory Program - Statement of Work.
Organics - SOW 3/90, revised August 1991.
Inorganics - SOW 3/90, March 1990

(a) One in 20 organic aqueous samples will be collected in triplicate for matrix spike and matrix spike duplicate analyses in accordance with CLP protocols; one in 20 inorganic aqueous samples will be collected in duplicate for matrix spike analyses.

(b) All samples will be stored in a refrigerated, dark area.

(c) Metals analyses, except mercury, will be performed by the furnace atomic absorption (As, Pb, Se, Tl) and inductively coupled plasma (ICP) atomic emission spectrometric methods. Mercury will be analyzed by the manual cold vapor atomic absorption method. Total cyanide will be analyzed by the manual spectrophotometric method.

(d) Water samples to be analyzed for cyanide will be checked in the field for the presence of chlorine using potassium iodide (KI) starch paper. If chlorine is present, 0.6 g ascorbic acid will be added.

TABLE 3

HOLDINGS TIMES FOR SOIL, SEDIMENT, AQUEOUS AND/OR WASTE SAMPLES

Parameter	CLP Holding Time for Samples: Aqueous	CLP Holding Time for Samples: Soil/Sediment/Waste
TCL Volatile Organic Compounds	10 days from VTSR[1]	10 days from VTSR[1]
TCL Base Neutral/Acid and Extractable Compounds	5 days to extraction from VTSR; 40 days from extraction	10 days extraction from VTSR; 40 days from extraction
TCL Pesticide/PCB Compounds	5 days to extraction; 40 days from extraction	7 days to extraction; 40 days from extraction
TAL Metals and Cyanide	180 days; except Hg - 26 days and Cn-12 days	180 days; except Hg - 26 days and Cn-12 days
Dioxins/Furans	NA	NA
TCLP		
Volatiles	NA	14 days to extraction; 14 days from extraction to analysis
Semivolatiles	NA	14 days to extraction; 7 days preparative extraction from TCLP extract. 40 days from prep. extraction to analysis
Mercury	NA	28 days to extraction; 28 days from extraction to analysis
Metals (except mercury)	NA	180 days to extraction; 180 days from extraction to analysis

NA = Not applicable; no holding times established according to the CLP SOW.

VTSR = Verified Time of Sample Receipt.

(1) Per U.S. EPA Region I requirements, the TCL VOC holding times are 7 days for unpreserved samples and 14 days for preserved samples, respectively, as measured from the date of collection.

TABLE 4

FIELD QC SAMPLES PER SAMPLING EVENT
(NEESA GUIDANCE FOR LEVEL D)

Type of Sample	Level C	
	Metals	Organics
Trip blank (for volatiles only)	NA[a]	1/cooler
Field blank	1/20 samples per matrix or 1/day/matrix for all analytes, whichever is greater	
Source water blank	1/each source of water	
Field duplicates[c]	10%	10%
Regulatory splits	AN[b]	AN[b]

a NA - Not applicable.

b AN - As needed.

c All field duplicates will be submitted as "blind" duplicates for quality control determinations.

TABLE 5

TARGET COMPOUND LIST (TCL) VOLATILE COMPOUNDS AND DETECTION LIMITS

Volatiles	CAS Number	Detection Limits[a] Water (ug/l)	Low Soil/Sediment[b] (ug/kg)
Chloromethane	74-87-3	10	10
Bromomethane	74-83-9	10	10
Vinyl chloride	75-01-4	10	10
Chloroethane	75-00-3	10	10
Methylene chloride	75-09-2	10	10
Acetone	67-64-1	10	10
Carbon disulfide	75-15-0	10	10
1,1-Dichloroethene	75-35-4	10	10
1,1-Dichloroethane	75-35-3	10	10
1,2-Dichloroethene (total)	156-60-5	10	10
Chloroform	67-66-3	10	10
1,2-Dichloroethane	107-06-2	10	10
2-Butanone	78-93-3	10	10
1,1,1-Trichloroethane	71-55-6	10	10
Carbon tetrachloride	56-23-5	10	10
Bromodichloromethane	75-27-4	10	10
1,2-Dichloropropane	78-87-5	10	10
cis-1,3-Dichloropropene	10061-01-5	10	10
Trichloroethene	79-01-6	10	10
Dibromochloromethane	124-48-1	10	10
1,1,2-Trichloroethane	79-00-5	10	10
Benzene	71-43-2	10	10
trans-1,3-Dichloropropene	10061-02-6	10	10
Bromoform	75-25-2	10	10
4-Methyl-2-pentanone	108-10-1	10	10

TABLE 5

(Continued)

TARGET COMPOUND LIST (TCL) VOLATILE COMPOUNDS AND DETECTION LIMITS

Volatiles	CAS Number	Detection Limits[a] Water (ug/l)	Detection Limits[a] Low Soil/Sediment[b] (ug/kg)
2-Hexanone	591-78-6	10	10
Tetrachloroethene	127-18-4	10	10
Toluene	108-88-3	10	10
1,1,2,2-Tetrachloroethane	79-34-5	10	10
Chlorobenzene	108-90-7	10	10
Ethyl benzene	100-41-4	10	10
Styrene	100-42-5	10	10
Total xylenes	1330-20-7	10	10

[a] Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated for soil/sediment calculated on dry weight basis will be higher.

[b] Medium soil/sediment detection limits for volatile TCL compounds are 120 times the individual low soil/sediment detection limits.

Note: Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

TABLE 6

TARGET COMPOUND LIST (TCL) SEMIVOLATILE COMPOUNDS AND DETECTION LIMITS

Semivolatiles	CAS Number	Detection Limits[a] Water (ug/l)	Detection Limits[a] Low Soil/Sediment[b] (ug/kg)
Phenol	108-95-2	10	330
Bis(2-chloroethyl)ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
1,2-Dichlorobenzene	95-50-1	10	330
2-Methylphenol	95-48-7	10	330
2,2'-oxybis(1-Chloropropane)[c]	108-60-1	10	330
4-Methylphenol	106-44-5	10	330
N-Nitroso-di-n-propylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
Bis(2-chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
2-Methylnaphthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	25	800
2-Chloronaphthalene	91-58-7	10	330
2-Nitroaniline	88-74-4	25	800

TABLE 6

(Continued)

TARGET COMPOUND LIST (TCL) SEMIVOLATILE
COMPOUNDS AND DETECTION LIMITS

		Detection Limits[a]	
Semivolatiles	CAS Number	Water (ug/l)	Low Soil/Sediment[b] (ug/kg)
Dimethylphthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
2,6-Dinitrotoluene	606-20-2	10	330
3-Nitroaniline	99-09-2	25	800
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	25	800
4-Nitrophenol	100-02-7	25	800
Dibenzofuran	132-64-9	10	330
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
4-Chlorophenyl-phenylether	7005-72-3	10	330
Fluorene	86-73-7	10	330
4-Nitroaniline	100-01-6	25	800
4,6-Dinitro-2-methylphenol	534-52-1	25	800
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenyl-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	25	800
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Carbazole	86-74-8	10	330
Di-n-butylphthalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3'-Dichlorobenzidine	91-94-1	10	330

TABLE 6

(Continued)

TARGET COMPOUND LIST (TCL) SEMIVOLATILE
COMPOUNDS AND DETECTION LIMITS

Semivolatiles	CAS Number	Detection Limits[a] Water (ug/l)	Low Soil/Sediment[b] (ug/kg)
Benzo(a)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
Bis(2-ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330
Dibenzo(a,h)anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330

(a) Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated for soil/sediment calculated on dry weight basis will be higher.

(b) Medium soil/sediment detection limits for semivolatile TCL compounds with a low detection limit of 330 ug/kg are 10,000 ug/kg; for semivolatiles with a low detection limit of 800 ug/kg, they are 25,000 ug/kg.

(c) Previously known by the name bis(2-chloroisopropyl)ether.

Note: Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

TABLE 7

TARGET COMPOUND LIST (TCL) PESTICIDES, PCBs,
AND DETECTION LIMITS

Pesticides/PCBs	CAS Number	Detection Limits[a] Water (ug/l)	Soil/Sediment[b] (ug/kg)
alpha-BHC	319-84-6	0.05	1.7
beta-BHC	319-85-7	0.05	1.7
delta-BHC	319-86-8	0.05	1.7
gamma-BHC (Lindane)	58-89-9	0.05	1.7
Heptachlor	76-44-8	0.05	1.7
Aldrin	309-00-2	0.05	1.7
Heptachlor epoxide	1024-57-3	0.05	1.7
Endosulfan I	959-98-8	0.05	1.7
Dieldrin	60-57-1	0.10	3.3
4,4'-DDE	72-55-9	0.10	3.3
Endrin	72-20-8	0.10	3.3
Endosulfan II	33213-65-9	0.10	3.3
4,4'-DDD	72-54-8	0.10	3.3
Endosulfan sulfate	1031-07-8	0.10	3.3
4,4'-DDT	50-29-3	0.10	3.3
Methoxychlor	72-43-5	0.50	17.0
Endrin ketone	53494-70-5	0.10	3.3
Endrin aldehyde	7421-93-4	0.10	3.3
alpha-Chlordane	5103-71-9	0.05	1.7
gamma-Chlordane	5103-74-2	0.05	1.7
Toxaphene	8001-35-2	5.0	170.0
AROCLOR-1016	12674-11-2	1.0	33.0
AROCLOR-1221	11104-28-2	2.0	67.0
AROCLOR-1232	11141-16-5	1.0	33.0
AROCLOR-1242	53469-21-9	1.0	33.0
AROCLOR-1248	12672-29-6	1.0	33.0
AROCLOR-1254	11097-69-1	1.0	33.0
AROCLOR-1260	11096-82-5	1.0	33.0

[a] Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated for soil/sediment calculated on dry weight basis will be higher.

[b] There is no differentiation between the preparation of low and medium soil samples in this method for the ?analysis of pesticides/aroclors.

Note: Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

TABLE 8

SURROGATE SPIKE RECOVERY RANGE

Fraction	Surrogate Compounds	Water % Recovery	Soil/Sediment % Recovery
Volatiles	Toluene-d_8	88-110	84-138
	Bromofluorobenzene	86-115	59-113
	1,2-Dichloroethane-d_4	76-114	70-121
Semi-Volatiles	Nitrobenzene-d_5	35-114	23-120
	2-Fluorobiphenyl	43-116	30-115
	Terphenyl-d_{14}	33-141	18-137
	Phenol-d_5	10-110	24-113
	2-Fluorophenol	21-110	25-121
	2,4,6-Tribromophenol	10-123	19-122
	2-Chlorophenol-d_4	33-110	(20-130)[a]
	1,2-Dichlorobenzene-d_4	16-110	(20-130)[a]
Pesticides	Tetrachloro-m-xylene	(60-150)[a]	(60-150)[a]
	Decachlorobiphenyl	(60-150)[a]	(60-150)[a]

[a] Advisory limits only

TABLE 9

MATRIX SPIKE RECOVERY LIMITS

Fraction	Matrix Spike Compound	Water[a]	Soil/Sediment[a]
VOA	1,1-Dichloroethene	61-145	59-172
VOA	Trichloroethene	71-120	62-137
VOA	Chlorobenzene	75-130	60-133
VOA	Toluene	76-125	59-139
VOA	Benzene	76-127	66-142
BN	1,2,4-Trichlorobenzene	39-98	38-107
BN	Acenaphthene	46-118	31-137
BN	2,4-Dinitrotoluene	24-96	28-89
BN	Pyrene	26-127	35-142
BN	N-Nitroso-di-n-propylamine	41-116	41-126
BN	1,4-Dichlorobenzene	36-97	28-104
Acid	Pentachlorophenol	9-103	17-109
Acid	Phenol	12-110	26-90
Acid	2-Chlorophenol	27-123	25-102
Acid	4-Chloro-3-methylphenol	23-97	26-103
Acid	4-Nitrophenol	10-80	11-114
Pesticide	gamma-BHC (Lindane)	56-123	46-127
Pesticide	Heptachlor	40-131	35-130
Pesticide	Aldrin	40-120	34-132
Pesticide	Dieldrin	52-126	31-134
Pesticide	Endrin	56-121	42-139
Pesticide	4,4'-DDT	38-127	23-134

[a] These limits are for advisory purposes only. They are not to be used to determine if a sample should be reanalyzed. When sufficient multi-laboratory data are available, standard limits will be calculated.

TABLE 10

TARGET ANALYTE LIST (TAL) INORGANICS AND CONTRACT REQUIRED DETECTION LIMITS (CRDL)[(a)]

Element	Detection Limit: Water (ug/l)	Detection Limit: Low Soil/Sediment (ug/g)
Aluminum	200	40
Antimony	60	12
Arsenic	10	2
Barium	200	40
Beryllium	5	1
Cadmium	1.5[c]	1
Calcium	5,000	1,000
Chromium	10	2
Cobalt	50	10
Copper	12[d]	5
Iron	100	20
Lead	3	1
Magnesium	5,000	1,000
Manganese	15	3
Mercury	0.05[e]	0.1[b]
Nickel	40	8
Potassium	5,000	1,000
Selenium	5	1
Silver	1[c]	2
Sodium	5,000	1,000
Thallium	10	2
Vanadium	50	10
Zinc	20	4
Cyanide	10	1

(a) Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Soil/sediment CRDLs are based on sample wet weights. Dry weight CRDLs will depend on the moisture content of the individual samples.

b Different aliquot.

c Obtain CRDL by using Graphite Furnace Atomic Absorption (AA).

d Obtain CRDL by using Inductively Coupled Plasma (ICP).

e Obtain CRDL by using Cold Vapor Atomic Absorption (AA).

TABLE 11

LABORATORY QUALITY CONTROL ANALYSES

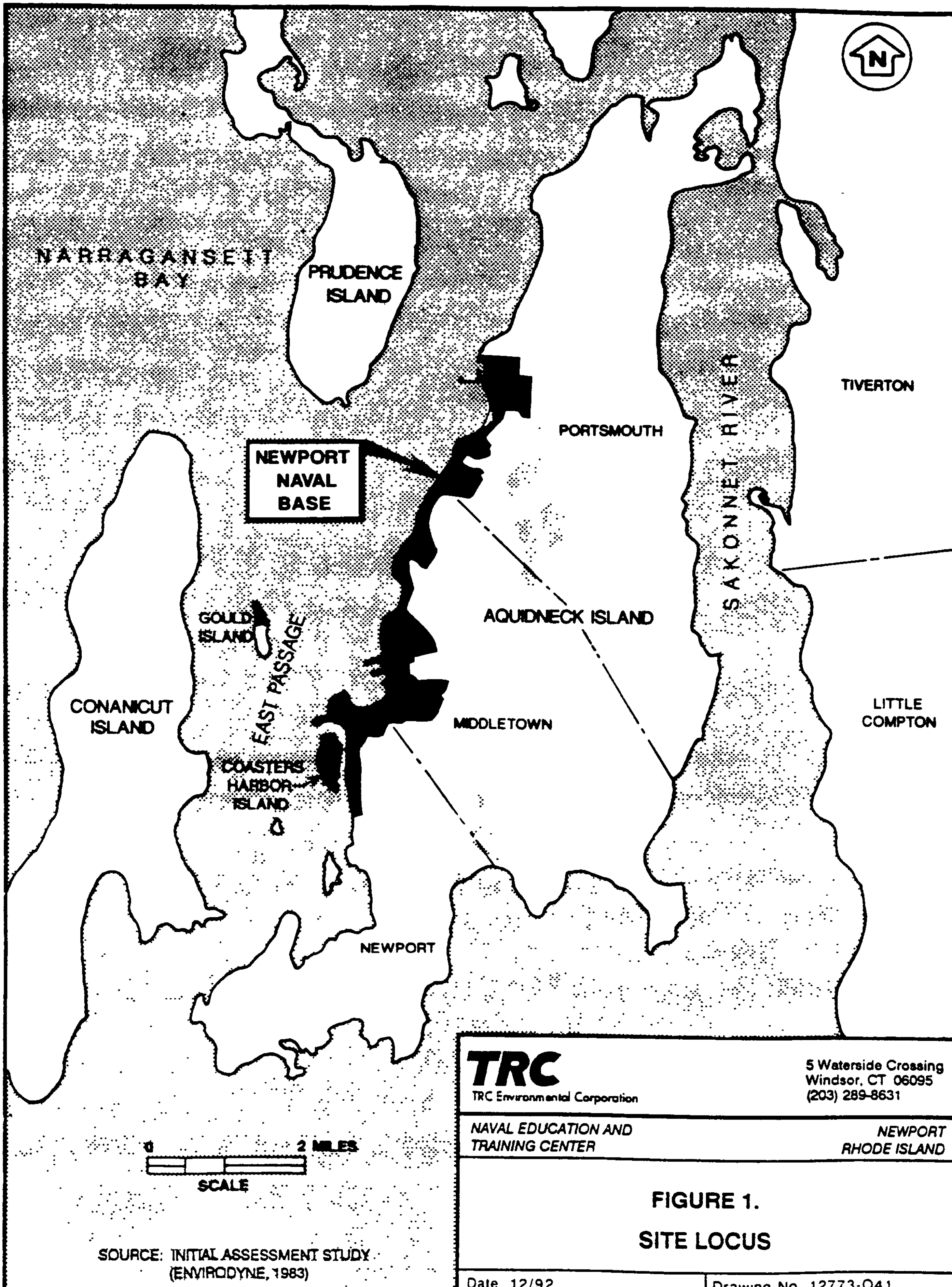
Analysis type	Frequency[a]	Control
Organic analyses		
Blank	1	Surrogate compounds
LCS and/or spiked blank	1	% recovery, analytes of interest
Duplicate	2	RPD
Matrix spike	1	% recovery of target analyte(s)
Matrix spike duplicate	1	RPD and % recovery
Inorganic Analyses		
Blank	1	No contamination
LCS and/or spiked blank	1	% recovery, analytes of interest
Duplicate	1	RPD
Matrix spike	1	% recovery of target analyte(s)

[a] Frequency is based on a batch of 20 samples or less of a similar matrix or whenever samples are extracted, whichever is more frequent.

LCS = Laboratory Control Sample

RPD = Relative Percent Difference

QUALITY ASSURANCE/QUALITY CONTROL PLAN
LIST OF FIGURES



TRC
TRC Environmental Corporation

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Windsor, CT 06095
(203) 289-8631

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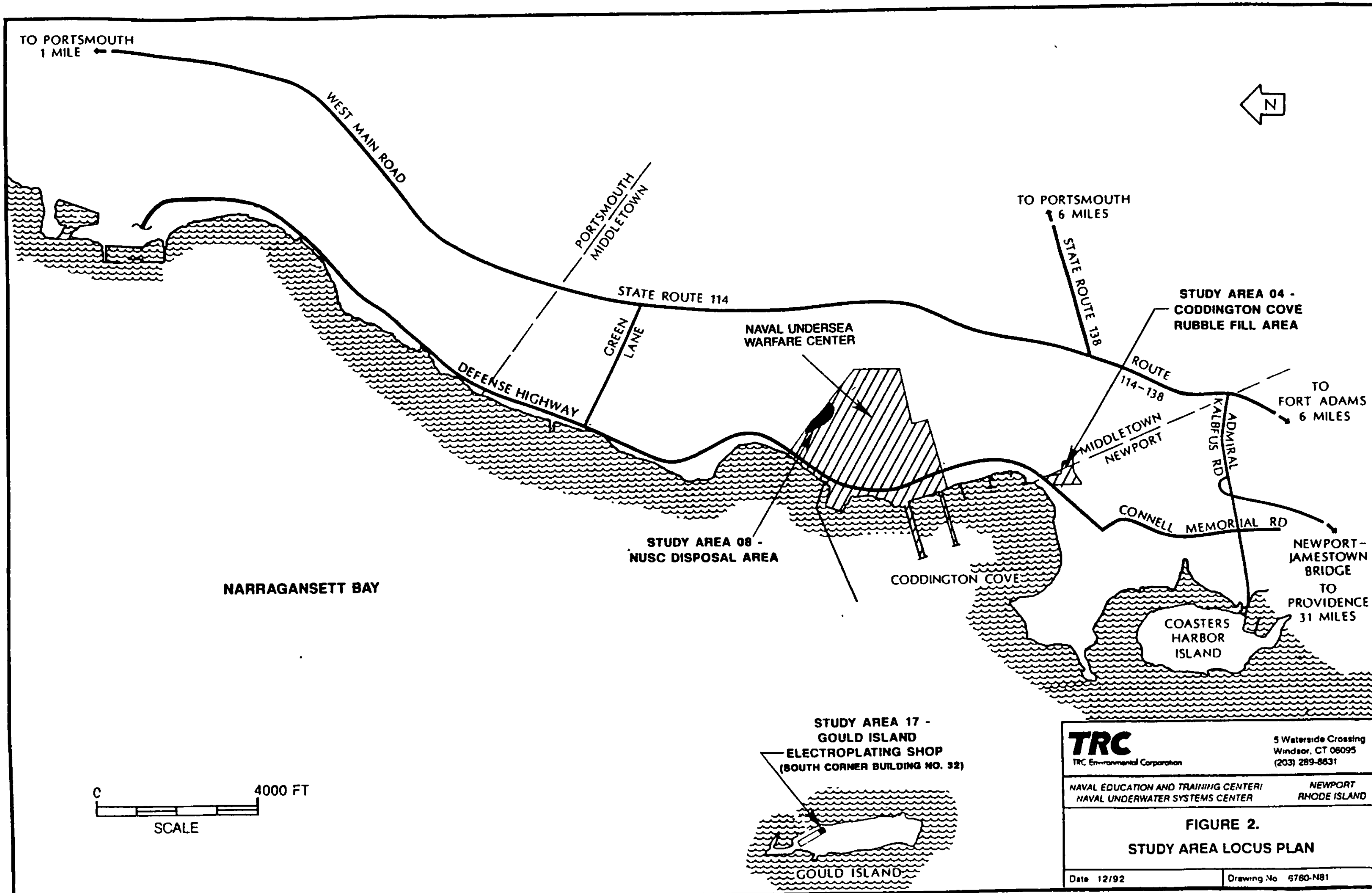
FIGURE 1.

SITE LOCUS

Date 12/92

Drawing No 12773-Q41



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NEWPORT
RHODE ISLAND

FIGURE 2.
STUDY AREA LOCUS PLAN

Date 12/92 | Drawing No 6760-N81

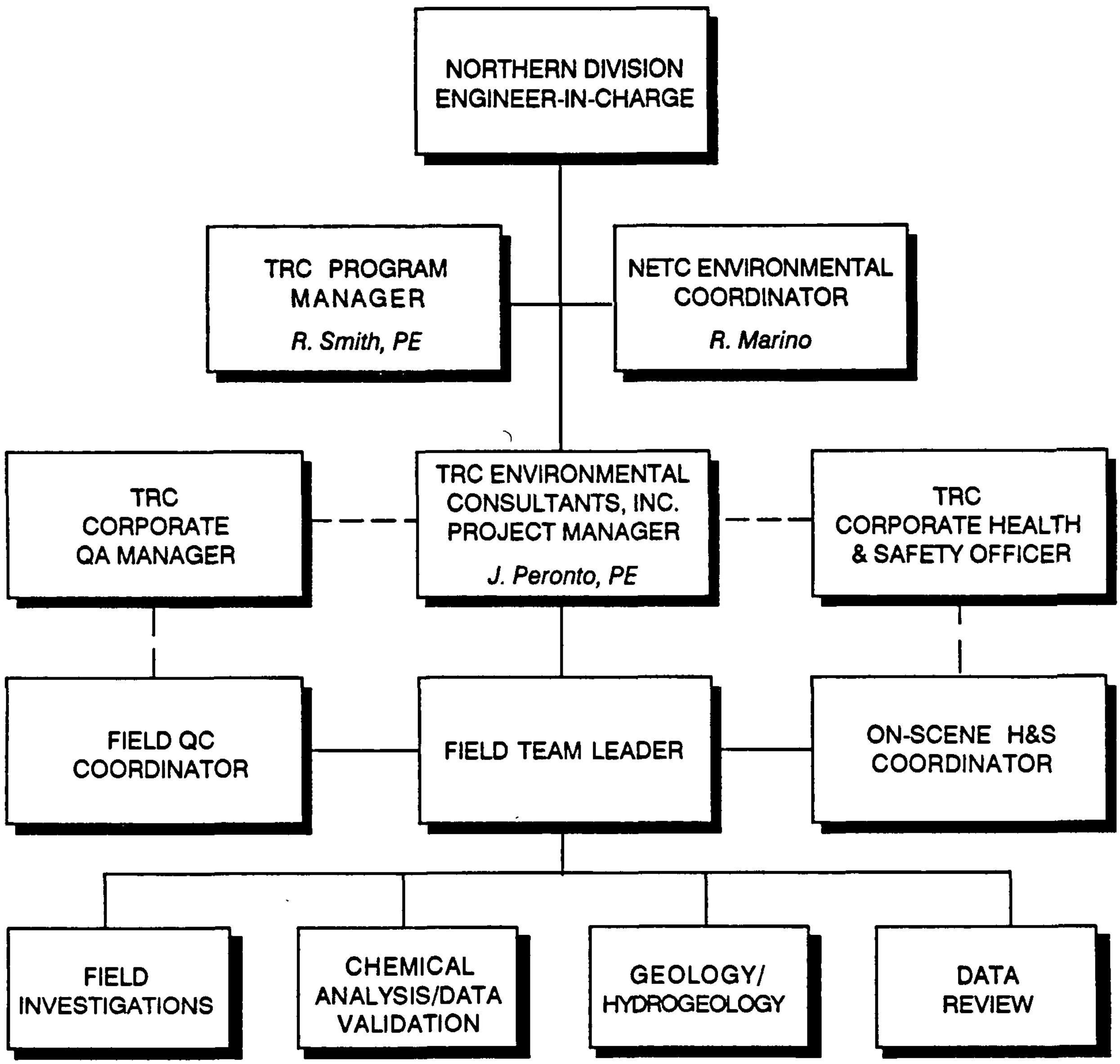

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FIGURE 3.

PROJECT ORGANIZATION

Date: 4/92

Drawing No.: 6760-N81

TRC Environmental Consultants, Inc

CHAIN OF CUSTODY RECORD

PR JECT NO.	PR JECT NAME						PARAMETERS	№ 2043
SAMPLERS: *(Signature)*			(Printed)					REMARKS
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS		

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	
(Printed)		(Printed)	
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	
(Printed)		(Printed)	
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time
(Printed)		(Printed)	
Remarks			

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

FIGURE 4. CHAIN OF CUSTODY RECORD

FIGURE 5
CORRECTIVE ACTION REQUEST FORM

CORRECTIVE ACTION REQUEST FOR NO. ________

Originator ____________________________ Date ____________________________

Person Responsible
for Replying ________________________ Contract
Involved ________________________

Description of problem and when identified: ____

____

____

____

State cause of problem, if known or suspected: ____

____

____

<u>Sequence of Corrective Action</u>: (If no responsible person is identified, notify QA Officer immediately. Submit all CA forms to QA Officer for initial approval of CA.)

State Date, Person, and Action Planned: ____

____

____

____

____

____

____

____

____

____

____

____

CA Initially Approved by: ____________________________ Date: ______________

Follow-up Dates: ____

Final CA Approval by: ____________________________ Date: ______________

Information copies to:

RESPONSIBLE PERSON/QC COORDINATOR: ____

QA OFFICER: ____

PROJECT MANAGER: ____

TRC